ELECTRICAL REVIEW

PIONEERS IN PLASTIC CABLE MANUFACTURE

Nearly ninety years ago the Telcon organisation made history by producing and laying the first successful Atlantic Telegraph submarine cable insulated with the natural thermoplastic developed by Telcon—Gutta Percha.

In 1938 the Company made another fundamental advance in cable making by introducing a new synthetic plastic insulant—polythene—used extensively for radio frequency cables during and since the war.

With this unique background Telcon have, for many years, produced a comprehensive range of polythene and PVC insulated cables for all purposes. Development continues and new types are constantly being added.

Power and Lighting Cables

PVC insulated and sheathed cables Polythene insulated PVC sheathed cables . . Polythene insulated aluminium sheathed cables . . . Polythene insulated high voltage armoured cables. . . . PVC sheathed PILC cables for corrosive conditions

Telecommunications Cables

Multipair audio-frequency and control cables . . . Quad type carrier frequency cables . . . Solid dielectric and helical membrane co-axial cables

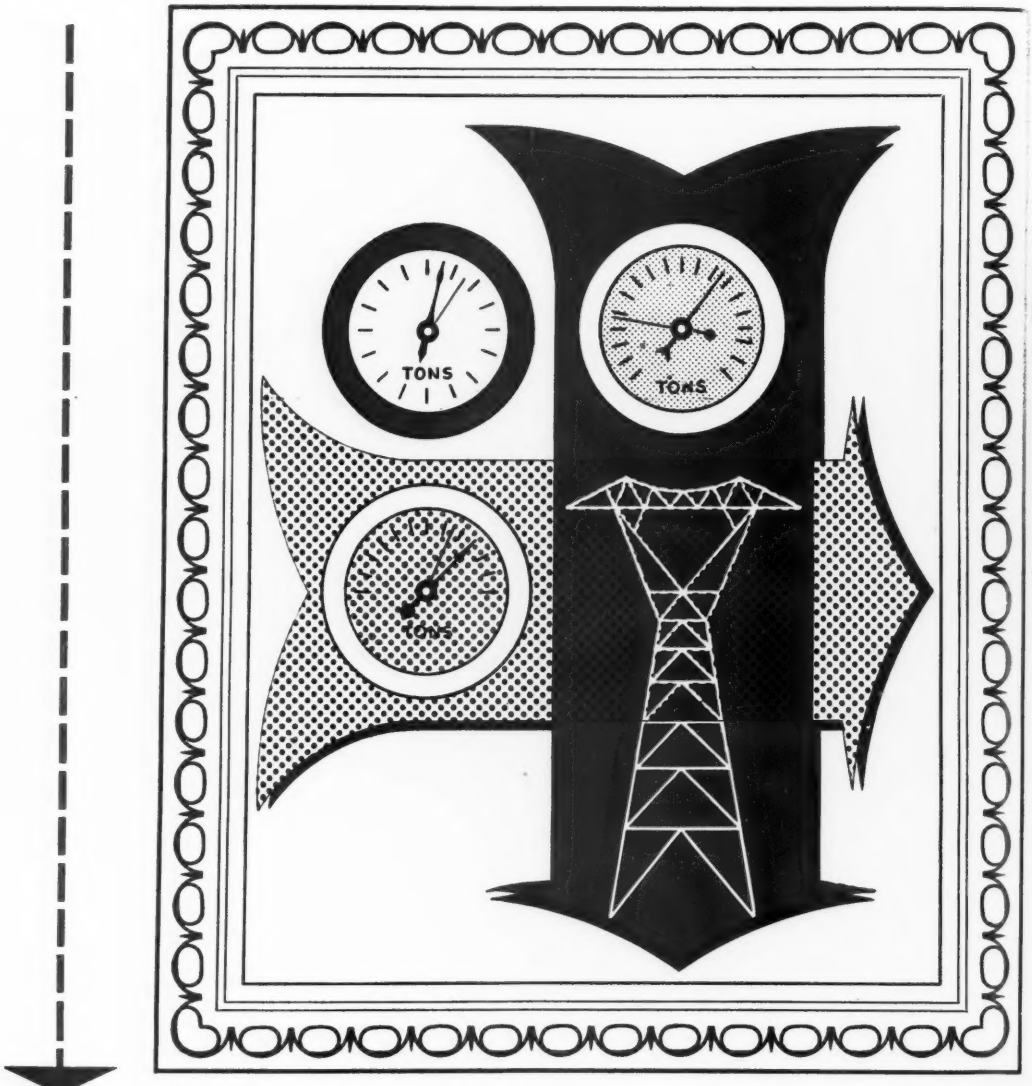
RF and Special Cables

Multicore Aircraft cables . . . Broadcast Relay and Sound Distribution cables Neon sign cables . . . Television Aerial Feeders . . . . High tension leads and flexibles . . . . Air Spaced and Solid Dielectric Co-axial cables . . . Helical Membrane cables . . . Thimble and Disc Insulated cables . . . Microphone cables Set connecting wires and screened leads Double screened cables . . . . . Non-microphonic cables . . . . . Transmission Lines Delay cables . . . . . Standard High Attenuation cables . . . Balanced Twin Feeders . . . Telconnectors (Plugs, Sockets and Terminations)

telcon

PLASTIC CABLES

The Painters View



of A Tower of Strength

OUR TOWER TESTING PLANT is unique in this country. Originally erected to test transmission towers for the English Grid System, its incomparable facilities are available to engineers from every part of the world who wish to test their designs. Full-scale testing to a programme which may include ultimate destruction will ensure that the requirements of the specification are satisfied with absolute economy.

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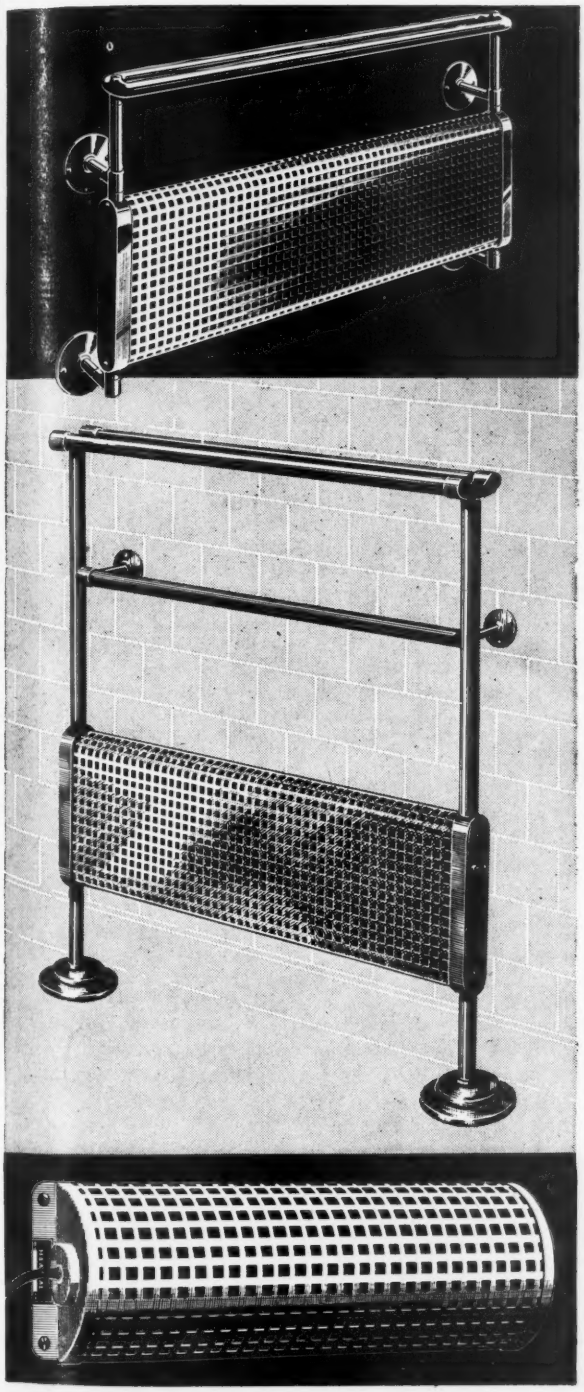

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Safety First — by Heatrae
Dry and well-aired clothes are essential for good health. Draw your customers' attention to these **Heatrae** modern and attractive electrical methods of EXTRA COMFORT.

Heatrae combined Air Warmer-Towel Rails, not only warm Bath Rooms or Dressing Rooms, but provide the comfort of warm, *dry* towels at all times.

They are highly attractive in finish and appearance; they are perfectly safe — being designed for a useful loading of 500 watts, and will not scorch fabrics hung on them.

Heatrae Airing Cupboard Heaters— although not intended for drying damp clothing, will keep clothes in ideal condition —ready for immediate use.

Our Leaflet No. **64/T** gives fullest illustrated information. We shall be pleased to send you copies.

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Manufacturers of:

Electric Water Heaters, Oil Heaters, Immersion Heaters, Urns, Towel Rails, Airing Cupboard Heaters, Flameproof Heating Apparatus, Breakfast Cookers, Electric Fires, Food Trolleys, Warming Plates, Air Heaters.

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and a prosperous
New Year to all
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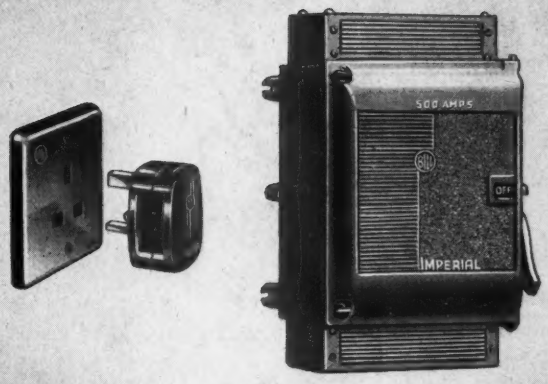
You cannot buy better gear



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13 AMP SOCKET OUTLET TO 500 AMP FUSE SWITCH

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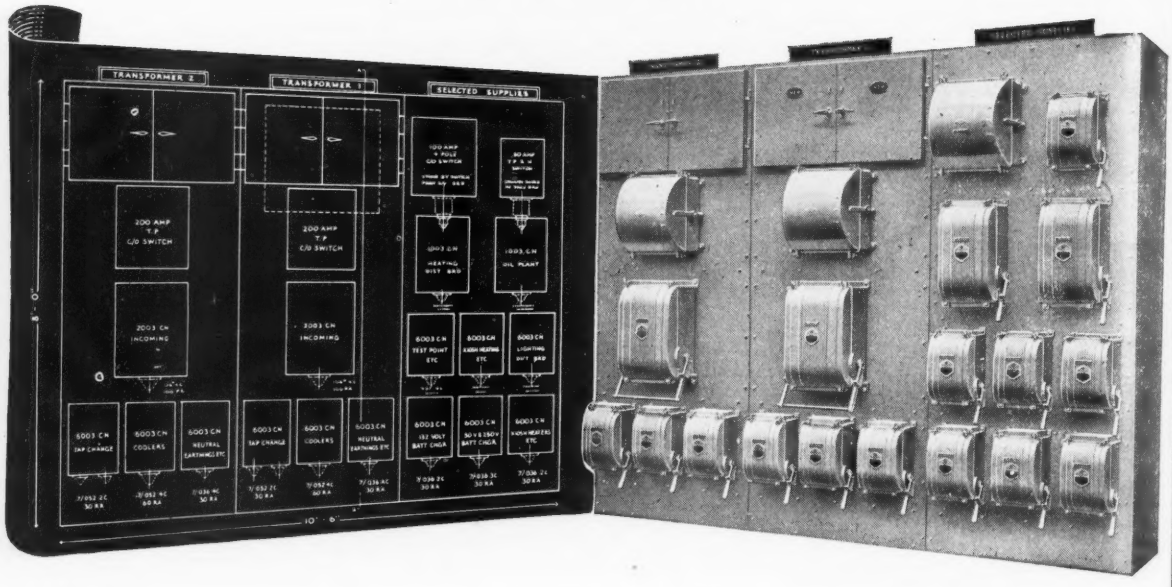

YOU know what a good job you get in standard MEM switch, fuse and motor control gear. You'll do just as well with your distribution switchboards and special motor starter panels. Extensions at MEM mean better service than ever at competitive prices. Specialist switchboard engineers will advise on producing the best solution to your problem. And there's a complete section of our works devoted to switchboard manufacture.

Get in touch with the MEM Switchboard Division or send for new switchboard booklet (List No. 329).

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Greater Uniformity
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Greater Durability
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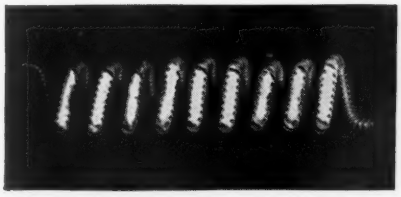

To take this completely unretouched photograph, the cathode was buried in a "Perspex" block, which was then polished down until the coated turns were cut, and a time exposure made with a projection microscope.

THE NEW BTH CATHODE

The illustration shows clearly how solidly the all-important emissive material is packed into the enlarged primary coil.

The secret lies in a far more ductile tungsten wire developed by BTH research. Tougher, more resilient cathodes are now being drawn and coiled, and the whole "geometry" of the design has been improved.

Mazda Fluorescent lamps stay brighter longer

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Identical in strength, lightness, concentricity and composition — they will get rid of a lot of your assembly troubles, whether you make ships or shooting brakes, tricycles or transformers.

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We shall be happy to give you expert advice on the best model to meet your particular cleaning needs. Our illustrated publication U.5007A showing many applications and containing some details is available upon request.

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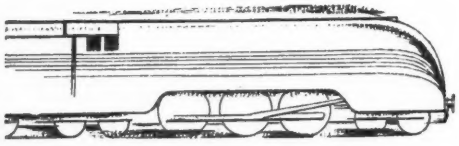

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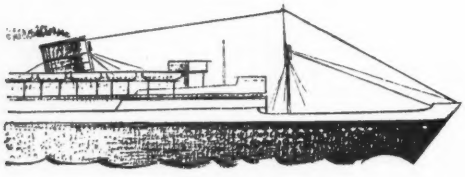
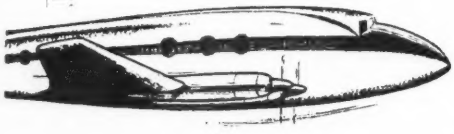


and yet more



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'ENGLISH ELECTRIC' transformers of the type shown have been installed at many farms throughout the British Isles.

The ENGLISH ELECTRIC Company manufacture a range of pole or platform mounting transformers and also substation transformers which meet the latest issue of British Electricity Specification T.1. (1954).

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Two ways of cutting electricity power costs

Ferranti Power Factor Correction Capacitor

MAXIMUM DEMAND ALARM

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If you are concerned by the rising cost of electrical power in your works, investigate these two sound methods of cutting power costs. First improve the overall 'power factor' of your plant by installing a Ferranti Power Factor Correction Capacitor, and so making effective use of ALL the current you pay for. In most works this device will recover its capital cost in one year.

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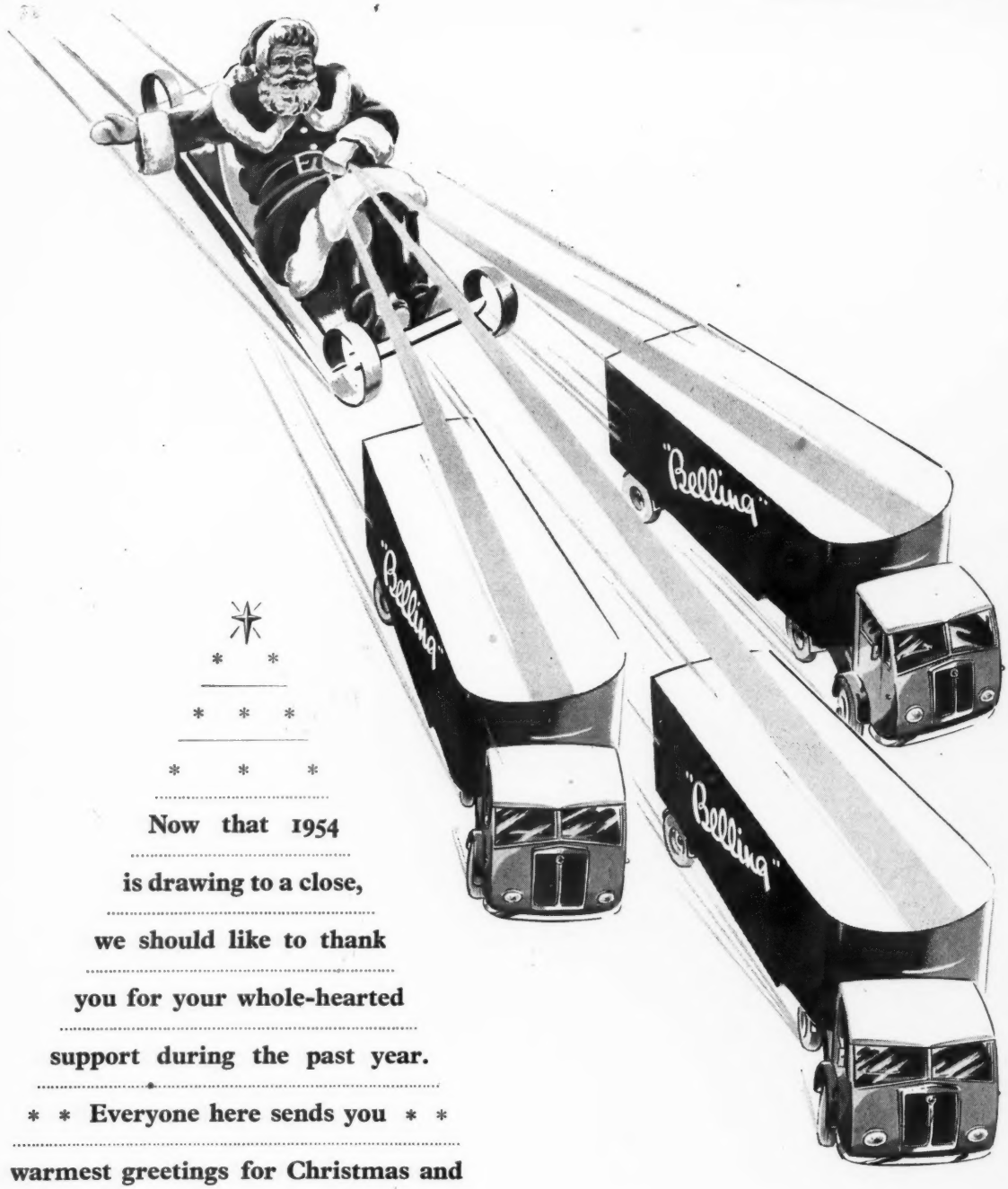

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Now that 1954

is drawing to a close,

we should like to thank

you for your whole-hearted

support during the past year.

* * Everyone here sends you * *

warmest greetings for Christmas and

the New Year, which we hope will prove to

* be as prosperous as this one. *

BELLING & COMPANY LIMITED

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MINING CABLES

for
DRILLS
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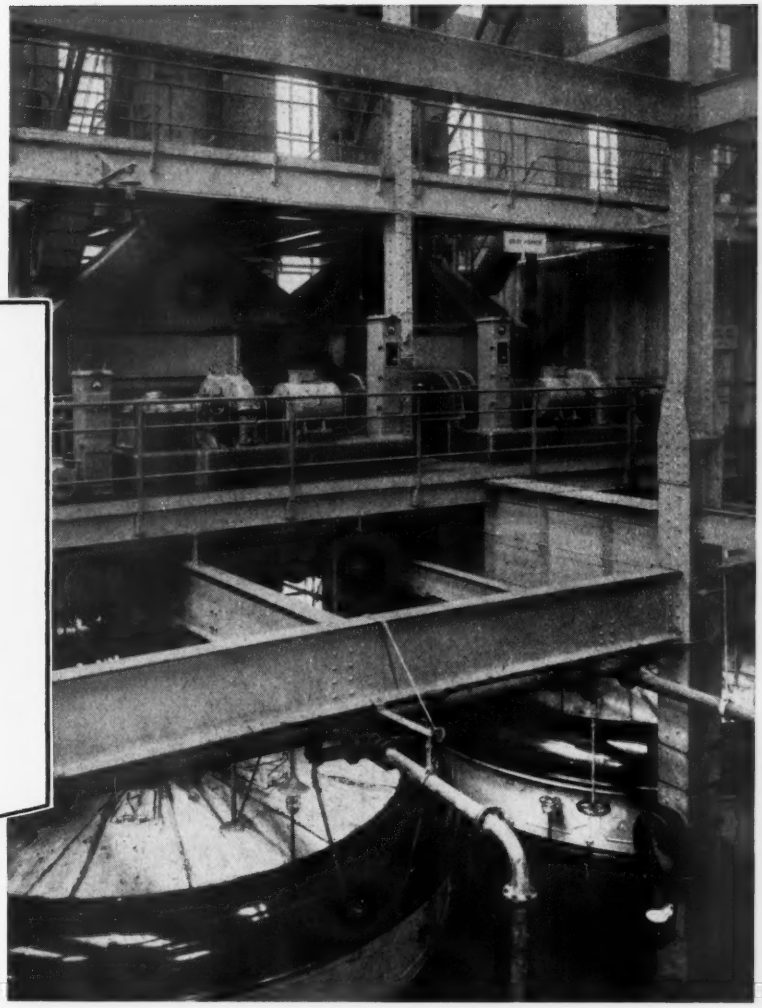

Installed at Guinness's Park Royal Brewery

BROOKHIRST

MOTOR CONTROL GEAR

Brookhirst Control Gear was supplied to Arthur Guinness Son & Co. Ltd., for controlling the processing plant in their Park Royal Brewery. In the illustration are shown three motor starting panels for drives situated in the Brew House.

As specialists with over fifty years' experience, Brookhirst are almost invariably associated with notable installations. They are called upon to solve motor control problems in activities as diverse as the manufacture of household goods and the production of atomic energy. With a world-wide reputation for quality, reliability and service, Brookhirst control gear is the inevitable choice of all who specify the best as a matter of long-term economy.

The services of Brookhirst Specialist Engineers are available to all concerned with the ordering, supplying and installing of control gear.

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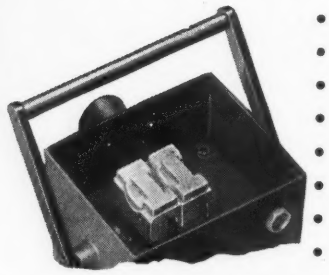
Partridge Low Voltage Transformer Units TYPE 2361

These low voltage units are available with back fixing straps for wall mounting, or fitted with carrying handle for use as portable units. (Ref. Nos. P/2361/1, etc.). They are designed for bench tool operation, lighting and similar industrial applications. The units are generally in accordance with BS.794/1938, and can be supplied with either 110v. or 25v. outlets or both. Windings have an earthed centre tap.



Above: Type 2361/5 (1,000 VA). Two 5 amp. and two 15 amp. outlet sockets.

Right: Interior view of Portable Unit Type P.2361/1 showing carrying handle and fuses.

Outlet sockets are of protected type, two-pole in accordance with BS.196.

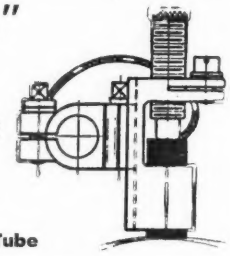
The number and rating of outlet sockets on each type of unit is given in the table below.

REF. NO.	RATING	OUTLET SOCKETS	
		5 Amp.	15 Amp.
2361/1	150 VA	1	—
2361/2	250 VA	2	—
2361/3	500 VA	1	1
2361/4	750 VA	1	1
2361/5	1,000 VA	2	2

Partridge Transformers Ltd • Tolworth • Surrey

Telephone: ELMbridge 6737

"WESTMINSTER" Brush Holders



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The WESTMINSTER ENG. Co. Ltd.

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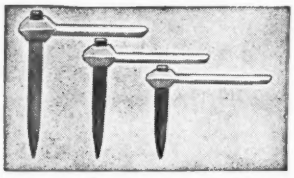

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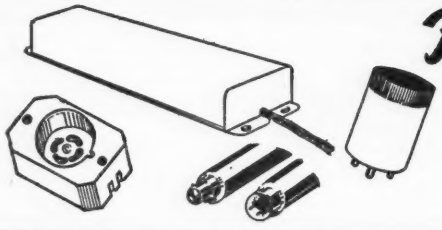

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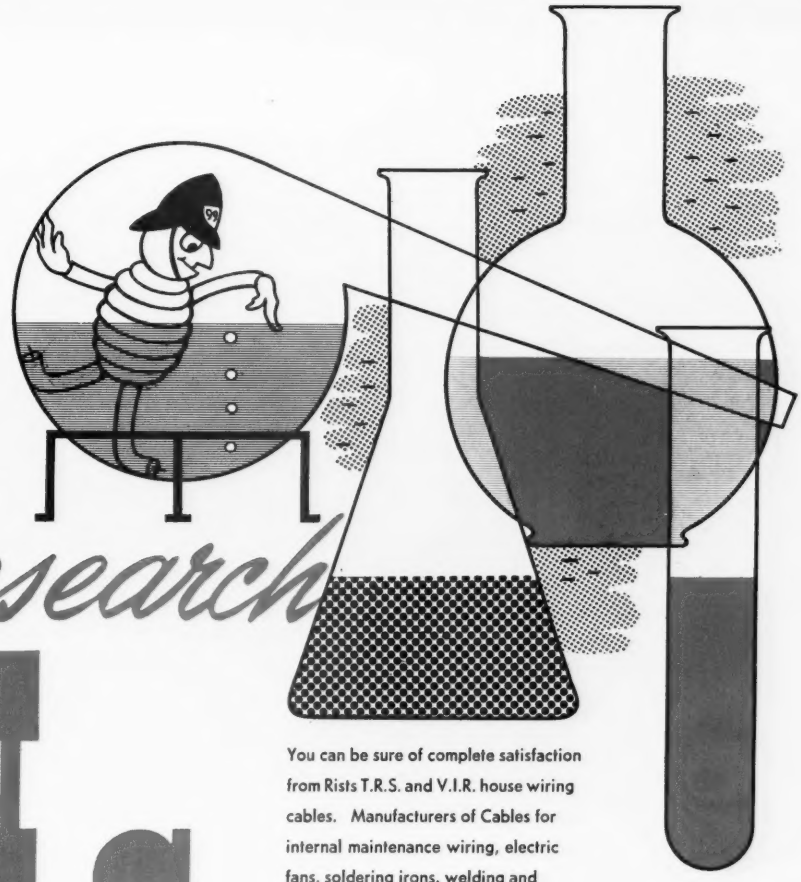

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Enfield

E31

Bees and Bats

EVERY NOW AND AGAIN, said the Managing Director, someone gets a bee in his bonnet. He wants to put a nut where no nut was ever put before, or drill a hole round umpteen corners in a place only a bow-legged dwarf could reach. What, my friends is the result? Production lines go haywire and foremen go berserk. Should we then send such a person to Coventry? Not so. We should send him instead to the Desoutter Works, where members of my loyal staff are lined up waiting to give him what he deserves—some entirely new small power tool which puts his idea into practice at positively no trouble to anyone.

This service, which we are happy to provide for those with bees in the bonnet, does NOT apply to those with bats in the belfry.

Desoutter tools *put power into your hands*

DESOUTTER BROS. LIMITED. THE HYDE, HENDON, LONDON, N.W.9. TELEPHONE: COLINDALE 6346 (5 lines) TELEGRAMS: DESPNUCO, HYDE, LONDON.

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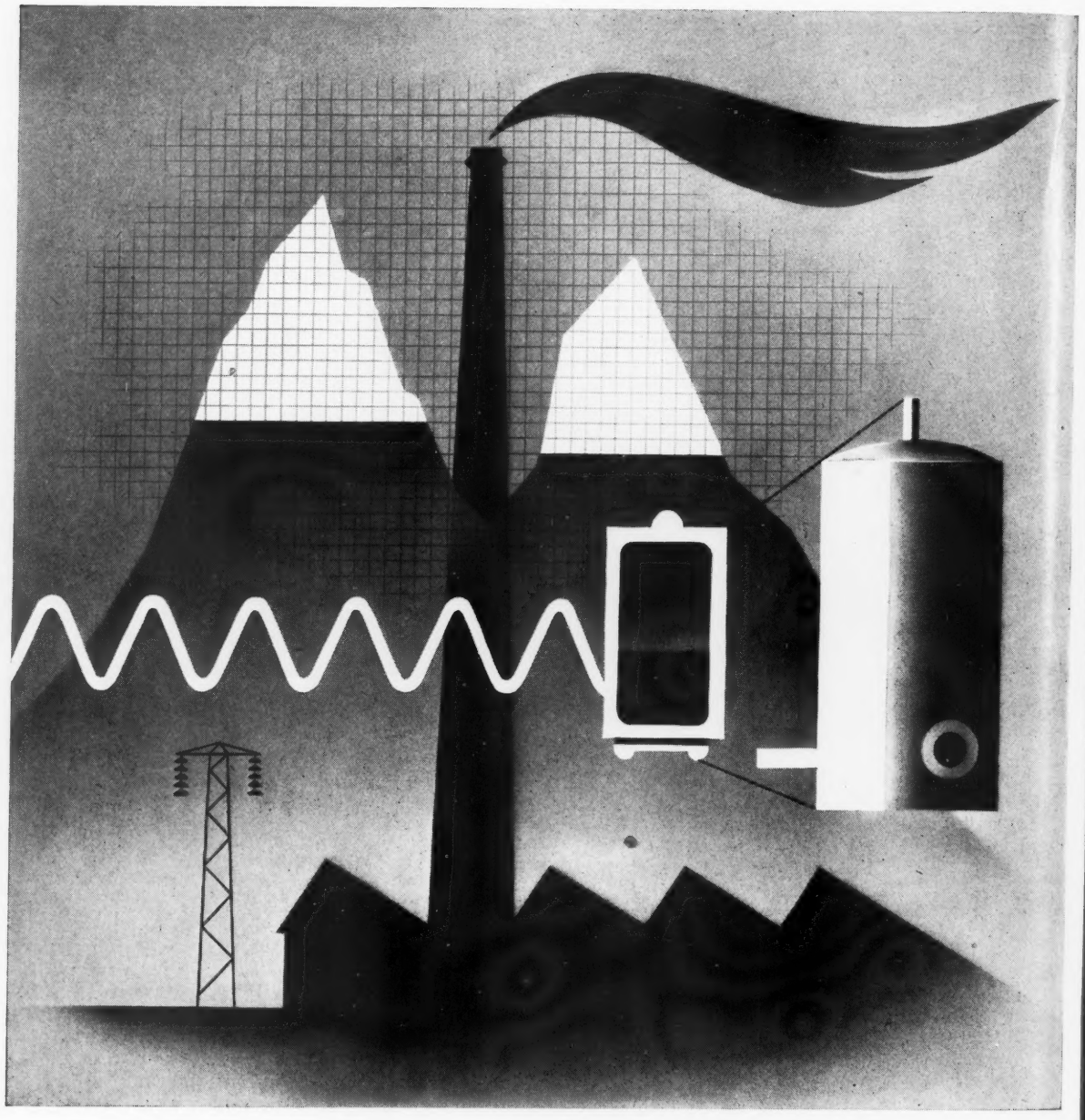

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Fully available electricity supplies enhance the value of " Rythmatic" ripple control as an investment for the electricity supply authority. With it certain loads may be transferred from peak periods to lightly loaded periods without inconvenience to the consumer but with considerable financial advantage to the supply authority. The availability of control also enables new load to be accepted without increasing maximum demand charges and the equipment offers the additional advantage of enabling the engineer to utilise his existing plant to sell more units.

The same injection equipment can also earn additional revenue if spare signals are used for two-part tariff metering and for street lighting control.
"Rythmatic" ripple control has been successfully applied for all these purposes.

RYTHMATIC RIPPLE CONTROL EQUIPMENT

AUTOMATIC TELEPHONE & ELECTRIC CO. LTD.
LONDON AND LIVERPOOL

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further additions

to the range of

BECKER

wiring accessories

15-AMP 3-PIN SURFACE TYPE SWITCH SOCKET OUTLET WITH FINGERSHIELD PLUG
LIST No. 2103/1530

—incorporating these special features—

- Controlled by positive action Q.M. and B. switch suitable for AC/DC mains.
- Fully insulated dolly.
- Snap action shutter assembly.
- Base made in glazed ceramic.
- Heavy duty construction throughout.
- Designed for ease of installation.

FLUSH PATTERN LIST No. 2104/1530 ALSO AVAILABLE

Illustrated Catalogue on request

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METER BOARDS
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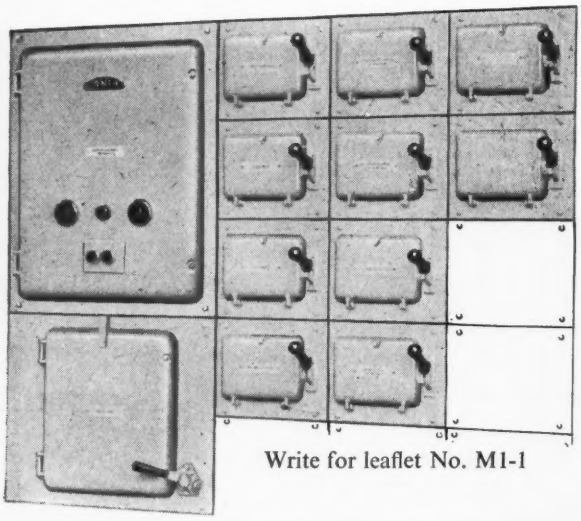

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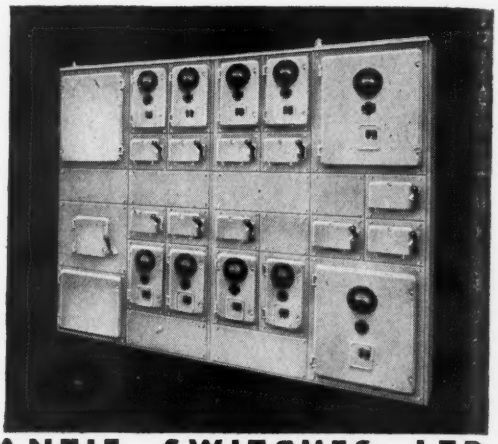
MINUNIT

CUBICLE SWITCHBOARDS

CM4

No space is wasted in MINUNIT switchboards; the units, designed to one basic standard dimension, can be grouped to form the most compact arrangement. Units can be banked one on top of the other, and the busbars and outgoing connections arranged to suit. All the internal connections can be taken to a single terminal board or gland plate, with front back, and side access.



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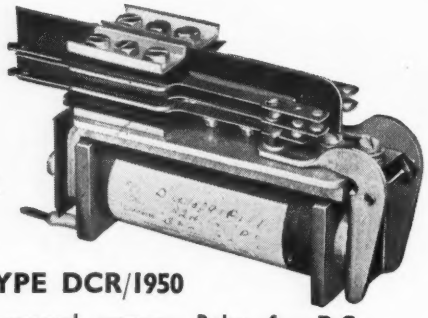

TYPE DCR/1950

A general purpose Relay for D.C. excitation. Switching capacity up to 8 amperes.

TYPE A.C.R/K

HEAVY DUTY A.C. RELAY

SWITCHING 35 amps. (up to 4 Poles or 2 Change over).

TROPICAL FINISH WHEN REQUIRED

Details of other types are available on request

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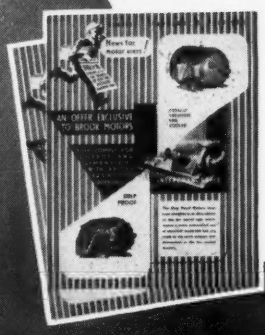
only BROOK

gives you more for less in A.C. motors



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BROOK MOTORS Ltd

Huddersfield

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Concerto for Klaxons!

The melodious notes of the latest Klaxons would not be out of place in a 'passage for horns'. But six Klaxons—all at once! We should need a Stravinsky to employ such stridency. Or should we? Most of the modern Klaxons are designed to work in silence, for the 'audible warning device' is but a tithe of our large output of today.

Though Klaxon is synonymous with motor horn (ask any decent dictionary), Klaxon's skill and ingenuity are found and favoured in many other electrical devices. You hear a great deal about them, even though some are proud of their quiet operation. Indeed, if millions of motorists were not continually blowing our own trumpet for us, we might get a little cocky (or tiddly-om-pom-pompous!).

KLAXON SYNCHRONOUS UNITS
in wide variety of gearings.

KLAXON F.H.P. MOTORS
with or without geared units.

KLAXON INDUSTRIAL SIGNALS
and power-driven Air Sirens.

KLAXON FLASHING SIGNALS
(winkers) for motor vehicles.

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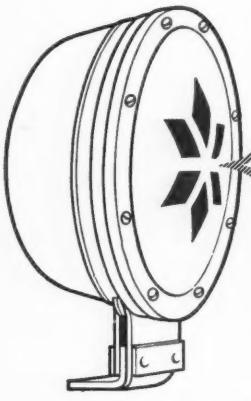
for screens of vessels and vehicles.

KLAXON LATEX TESTER
controlled speed 14,000 r.p.m.

KLAXON

We invite enquiries, are prompt with specifications and quotations. We undertake research and development by arrangement. Delivery is prompt and our prices, apparently, refreshingly keen.

MAKE MANY THINGS *AS WELL AS* HORNS

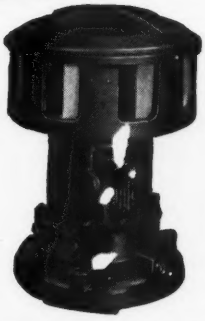


KLAXON AIR SIRENS
TYPE G.M.1.

The G.M.1 Siren is driven by a Klaxon 1 h.p. motor, has an audible range of 1½ miles, and can be supplied for operation in any voltage up to 550.

A complete range of Klaxon Control Equipment is available for use with all Klaxon Sirens to provide Wailing or Steady Signals and also for remote control. Time Switch Shutter equipment can be supplied for the transmission of Coded or Special Signals.

Klaxon Sirens are manufactured in sizes from 1/10th to 10 h.p. with ranges from 300 yards to 5 miles. They have been installed for use on ships, patrol cars, ambulances, fire and burglary alarms, factory and harbour installations.



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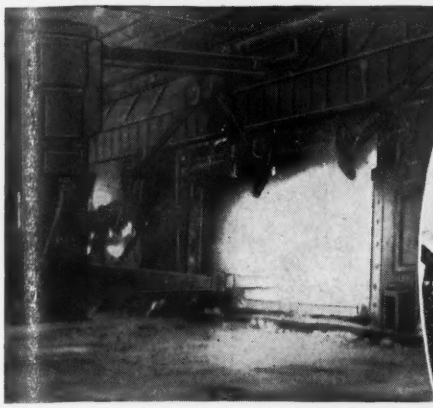
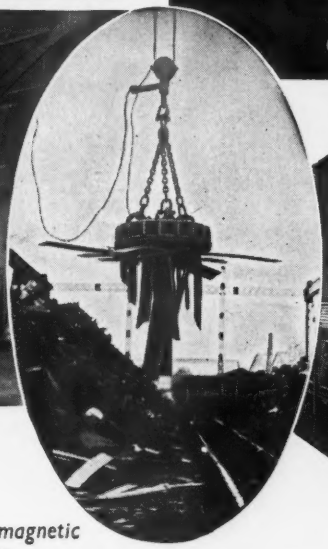
CVS-1E

Hewittic Rectifiers

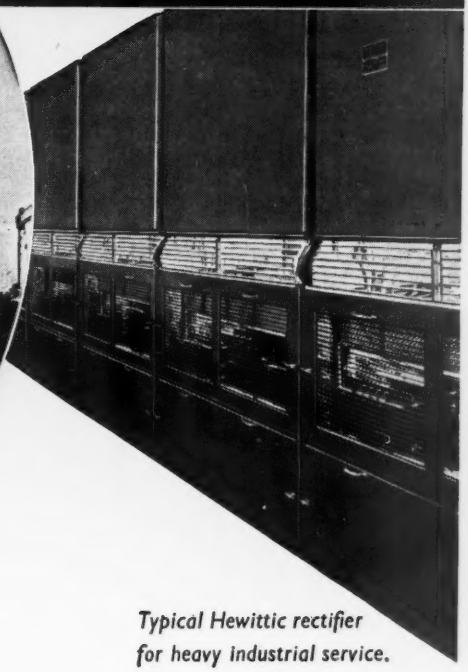
for D.C. Supply in IRONWORKS and STEELMILLS



For operating furnace equipment.



For lifting magnets, magnetic separators, cranes etc.



Typical Hewittic rectifier for heavy industrial service.

★ Over 1½ million k.W. in world-wide service

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WALTON-ON-THAMES - SURREY - ENGLAND
Telephone : Walton-on-Thames 760 (8 lines) *Telegrams : "Electric, Walton-on-Thames"*

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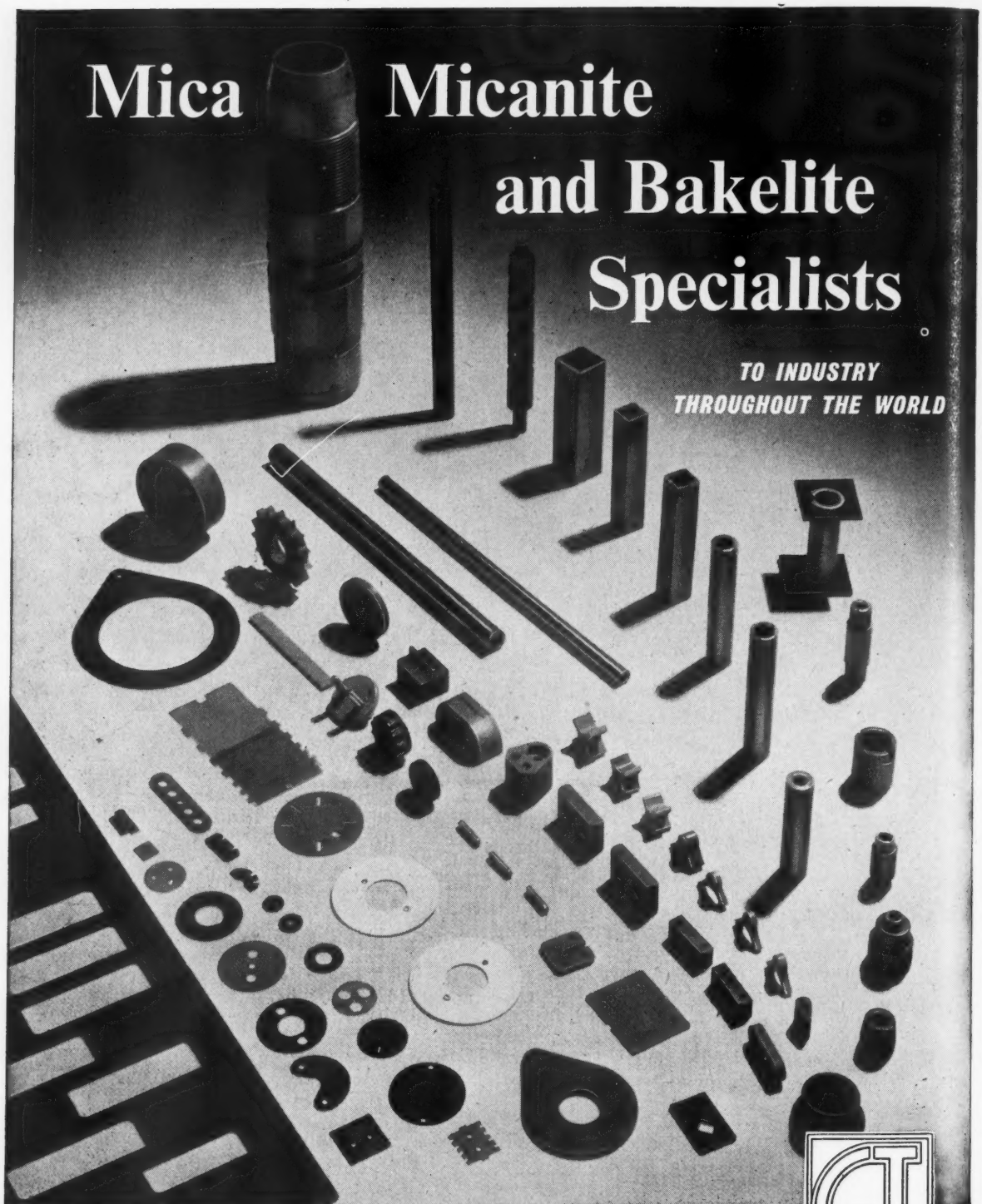

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The Series 1 instrument, illustrated above, is ideal for testing high tension equipment, insulators, transformers, motors, generators, cables, etc. Instruments are available with hand-driven generators or can be supplied with hand-and-motor drive. Ranges up to 100,000 megohms—Testing pressures up to 5,000 volts. Special 5,000 volt and 10,000 volt mains operated instruments are also available.

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The strong tank is shot blasted before painting inside with oil resisting paint and outside with red lead to provide the best base for finishing. Cadmium plated bolts are used and oil level indicator fitted—helping to save maintenance time.

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The low iron loss for which LOFEL transformers are famous results in direct saving of power. Made in 5, 15 and 25 kVA sizes, Gresham LOFEL transformers have been installed by practically every Area Board in the country to cut operating costs.

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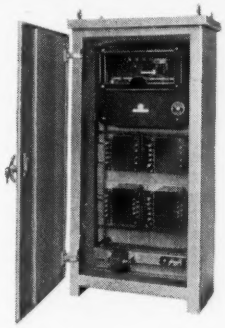

Suitable for the stabilisation of mains variation up to ± 15% to within ± 1% irrespective of load or variations in input frequency. Maximum response times within one second. Available range:
single phase: up to 15 KVA.
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The Range of Electric Water Heaters, large and small, to meet every need. Each unit is built to a proud standard of perfection arrived at by more than 30 years of specialisation in electric water heating problems.

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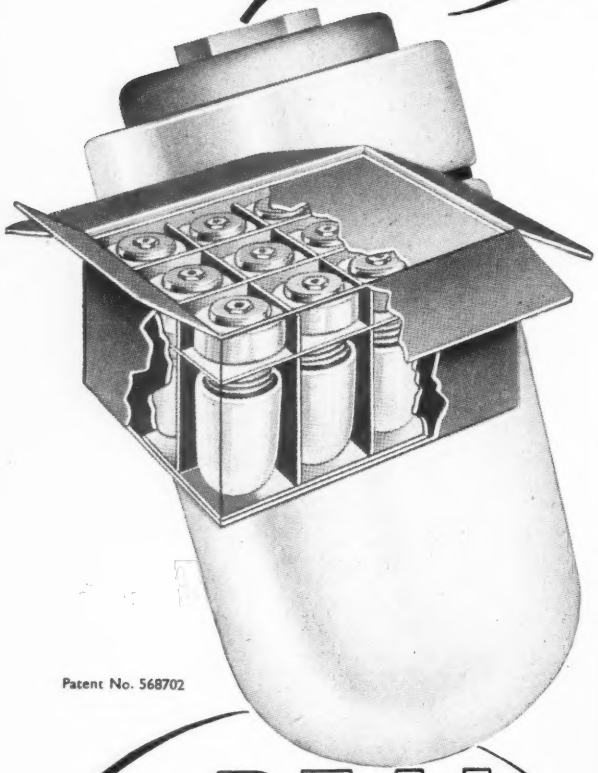

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...for a R.E.A.L. Watertight fitting

Buy your fittings by the dozen, in this rail-certified container, and lift them out in perfect condition.... Nothing broken.... no lost rubber rings or lamp-holders..... no straw-covered glasses to clean. R.E.A.L. Watertight Fittings arrive as YOU want them, because they are packed this way.

Probably the use of R.E.A.L. non-corrodible watertight fittings is standard practice with you; in which case you already know that erection cost is shillings less than ordinary — and ordinarily packed — watertight fittings.

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30% MORE LIGHT

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Osram

NEW WARM WHITE
FLUORESCENT TUBES

BEFORE JULY 1953 OSRAM WARM WHITE & DAYLIGHT TUBES GAVE 3,200 LUMENS*

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TUBES

* Average light output for the 5ft. tube during the first 5,000 hours of life.

THE GENERAL ELECTRIC CO., LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2.

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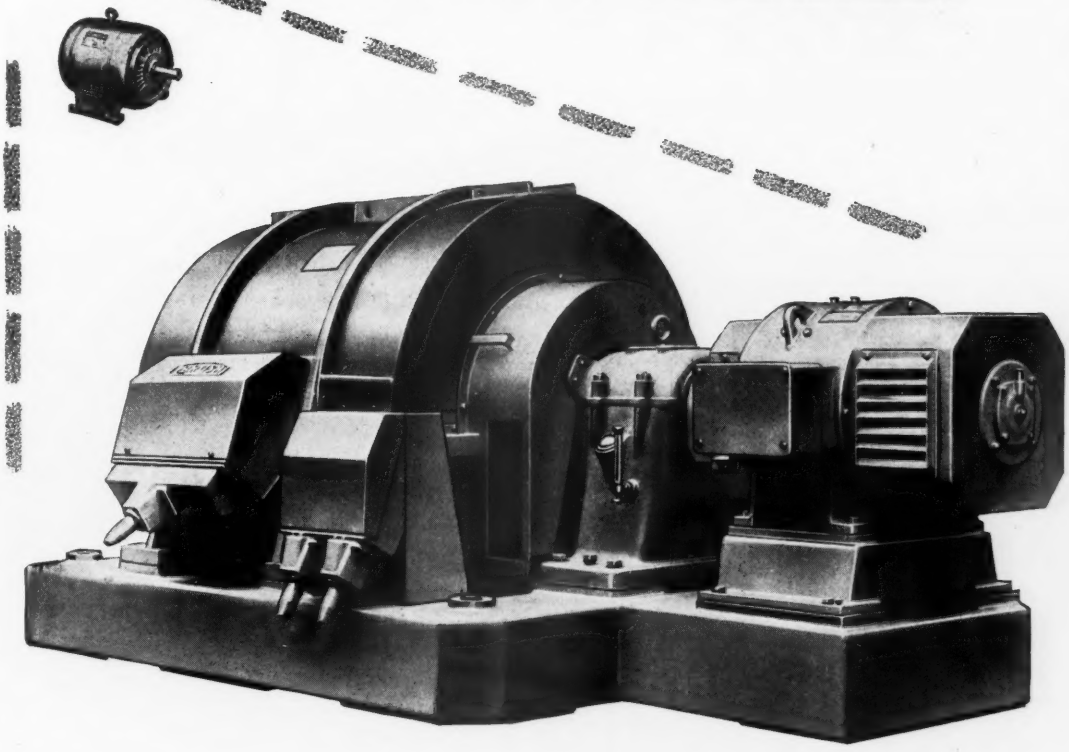

...it's from one to 3,000 horse power

What does that mean? It means that if your electric power requirements fall anywhere between 1 h.p. and 3,000 h.p. there is a choice of Brush motors to supply them. Within this range it is possible to meet every familiar need—and many needs that are not so familiar. Brush motors are built to work anywhere, to stand up to anything. The secret of this reliability lies in the rigid rules of quality that govern every stage of production. But there is nothing rigid about your choice of types: industrial—flameproof—squirrel cage or slipring—synchronous or synchronous-induction . . . Brush make them all, including special 60-cycle machines for U.S.A. and Canada to conform with NEMA and CSA standards. Let us know which part of the BRUSH range concerns you so that we can send you the full information.

Electric motors

from 1 h.p. to 3,000 h.p. by BRUSH

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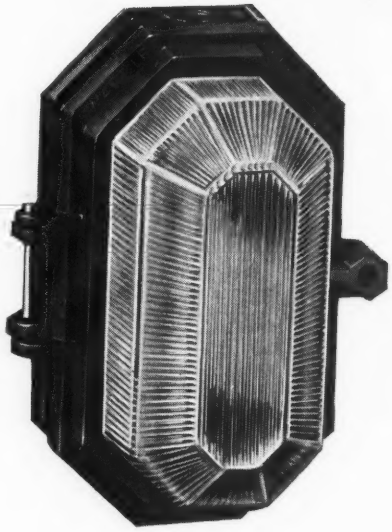
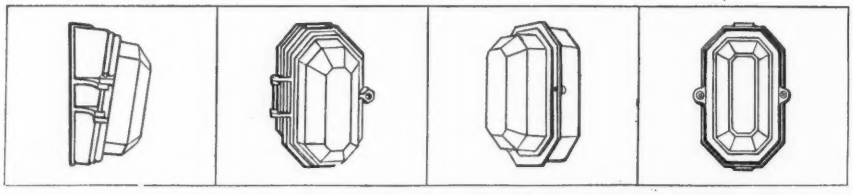
PRISMALUX SIMPLIFIES DIRECTIONAL LIGHT CONTROL





TILTED for subways, cable and conduit runs, arches.

GUARDED for passages, stairways, porches, doorways.

RECESSED for low ceilings and confined spaces.

DETACHABLE cover for corners of passages, cellars, arches.

The PRISMALUX DIRECTIONAL LIGHTING UNIT gives power economy combined with maximum illumination and meets modern requirements both in appearance and practicability.

Embodied in the design is a full size reflector to give maximum illumination, and the glass front includes a carefully designed system of prisms to control the light.

It is available in enamelled or galvanised finish, with a choice of seven inlet points. The main illustration above shows the standard PRISMALUX, suitable for most purposes, whilst the insets show special applications.

Obtainable from all leading stockists or direct from the Works where "MAXHEAT" Oval Tubular Electric Heaters; "WORKSLITE" Reflectors and Wardle Floodlights are made.

PRISMALUX STILL COMMANDS THE WORLD'S LARGEST SALE

THE **Wardle** ENGINEERING CO LTD · OLD TRAFFORD · MANCHESTER 16

Quicker HEATING...

Quicker SELLING

THE NEW B·N·E C.90 ELECTRIC COOKER

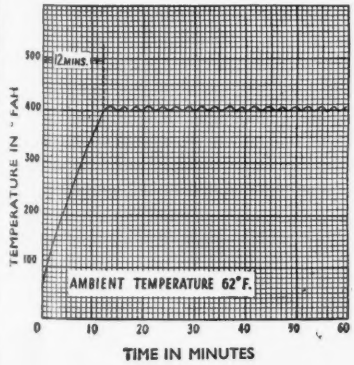
WITH THE AMAZING SPEEDHEAT OVEN!

The outstanding performance of the "Speedheat" Oven in the B.N.E. C.90 Electric Cooker—the newcomer to the B.N.E. range—will make an instant appeal to the discerning housewife.

Here is a big "easy-to-clean" oven with a new element design which, when coupled with the highly reflective pearl grey vitreous enamel and scientifically controlled air circulation, provides remarkably quick heating with superb cooking qualities.

The pre-heating time is only half that of many standard cookers. Every housewife will realise that this spells greater convenience and considerable saving of time and current.

The graph alongside shows that a temperature of 400°F is reached from an ambient temperature of 62° in **only 12 minutes.**



Yes, this new "Luxury" C.90 will be a quick seller—particularly when the purchaser knows that an exclusive Pyrex heat-resisting glass casserole/grill pan, a heated drawer, and an 8" radiant plate with simmer control are all included for the moderate price of £48.

BRITISH NATIONAL ELECTRICS LTD.

The Domestic Appliance Section of JOHNSON & PHILLIPS LTD.

NEWARTHILL MOTHERWELL SCOTLAND

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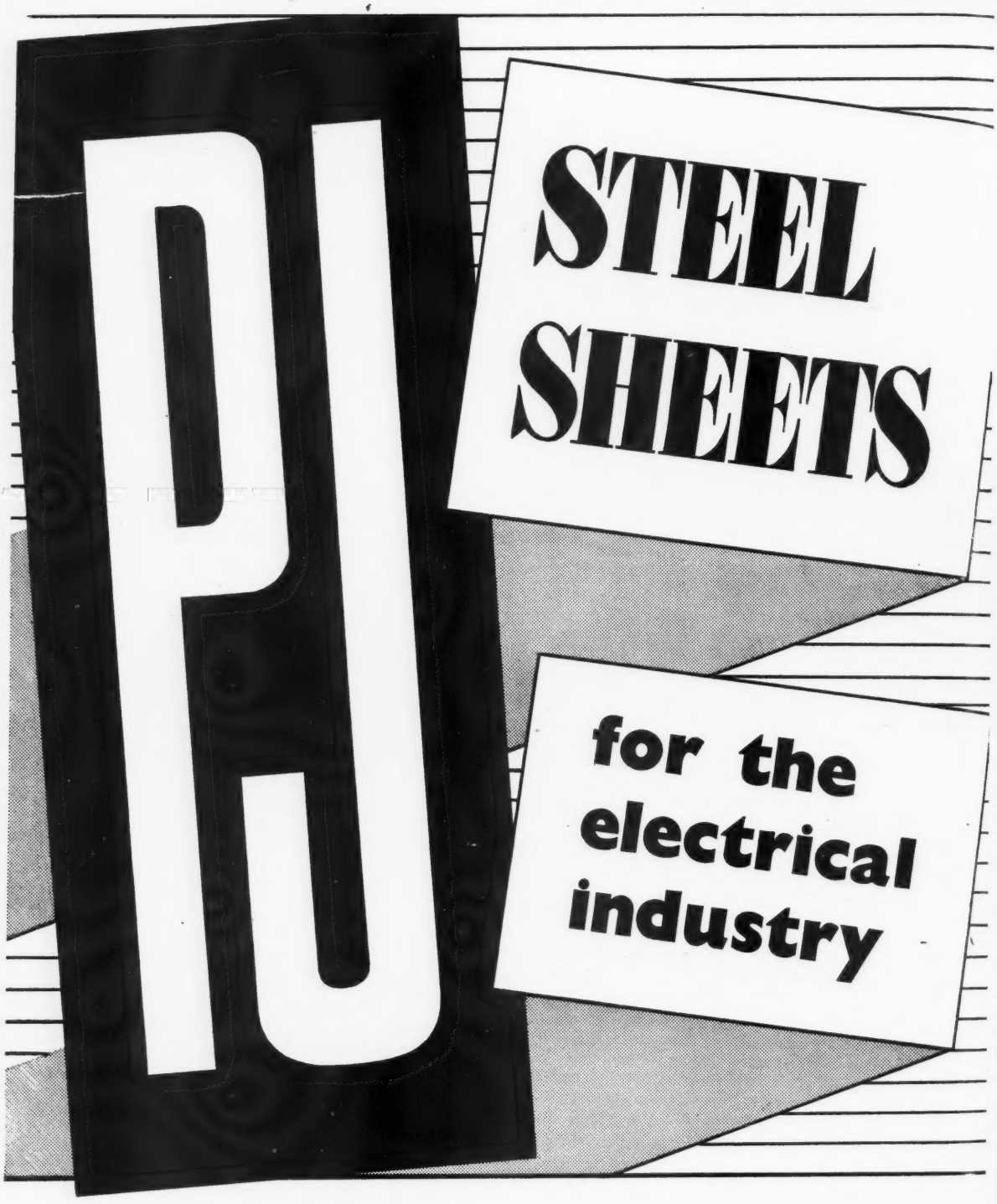

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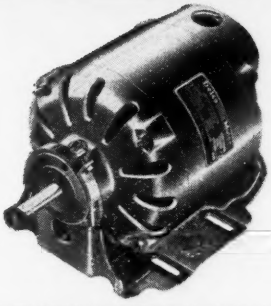
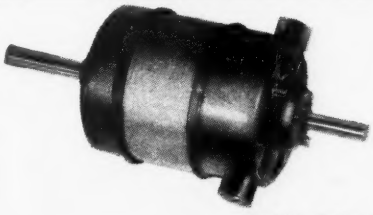
Telephone: **Pontypool 131/2**

IT'S A GOOD PLAN WHICH INCLUDES

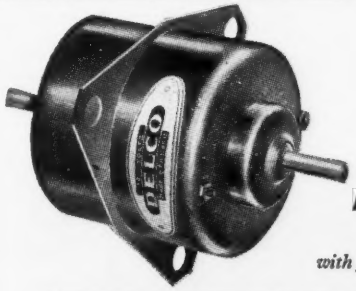
DELCO motors



DELCO
6¼" TYPE



DELCO 310 TYPE



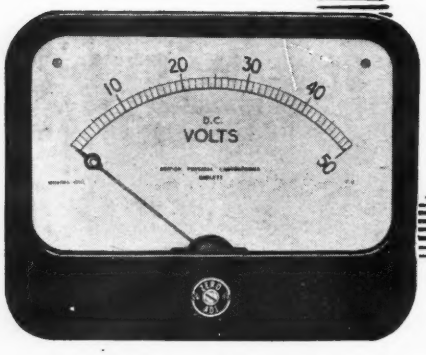
DELCO
258 TYPE
with flange mounting

Before you start work on your plans for domestic and industrial applications which call for compact, high-efficiency electric motors . . . consult the Delco engineers. The Delco range includes motors to meet most modern requirements. These versatile motors are so designed as to be easily adapted to suit your individual needs.

Write for descriptive leaflet featuring motors for use in:—

WASHING MACHINES · FOOD MIXERS · PROJECTORS REFRIGERATORS · AIR CONDITIONERS · OFFICE MACHINERY · LAWN MOWERS · FURNACE BLOWERS WATER PUMPS · FARM MACHINERY · KITCHEN WASTE DISPOSAL UNITS · VEGETABLE PEELERS

AC-DELCO DIVISION OF GENERAL MOTORS LTD DUNSTABLE BEDS



Early deliveries available of all types.

Rectangular Pattern

SWITCHBOARD METER

Flush mounting type meter of contemporary styling available for moving coil and moving iron meters, for any range. Scale sizes 6", 9" and 12". Standard round patterns available with 4", 6" and 8" dials.

We welcome your enquiries and will forward prices and full details of our unique range on request.

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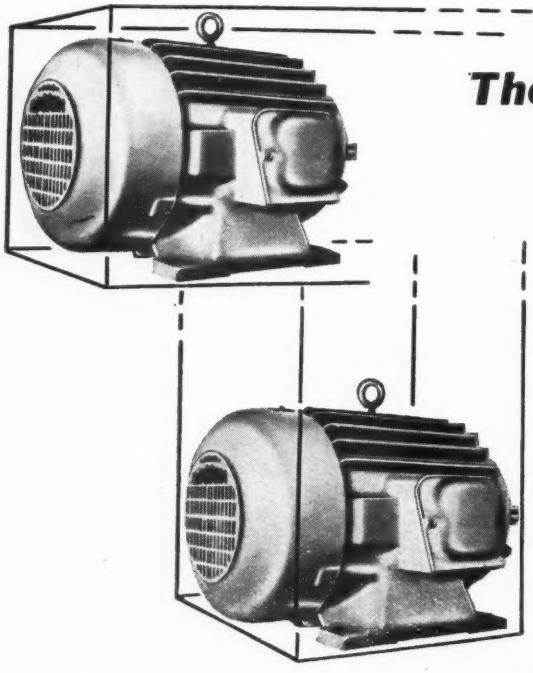

The fitting answer . . .

Users of motors for driving machinery will probably find the answer to their standardised motor needs in the Brush 'B' range of squirrel cage, totally enclosed, fan cooled types. They are built to British Standard Dimensions (B.S. 2083, 1954) which determine all basic fixing and general physical dimensions to ensure that these motors are interchangeable with other B.S.D. Motors.
Designed and built from accumulated experience gained from over 70 years of electric motor manufacture, these sturdy machines will meet arduous conditions of service.
The range of sizes available covers from 1 to 25 h.p.

WRITE TODAY FOR STOCK LIST

B.S.D. Motors by BRUSH

BRUSH ELECTRICAL ENGINEERING CO. LTD., HOPKINSON WORKS, CARDIFF, GREAT BRITAIN

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'CORRILUX'

—ideal lighting fitting for indoors—because of its excellent appearance; and for outdoors—because the Corrilux is completely weatherproof, will not corrode and is of great strength

LOWEST PRICED 27/- 100w BULKHEAD FITTING

Exceptional strength
body made of corrosion-resisting aluminium alloy, frosted finish

Excellent light distribution

Really attractive
appearance and finish

Simple
installation—simple maintenance

Completely weatherproof

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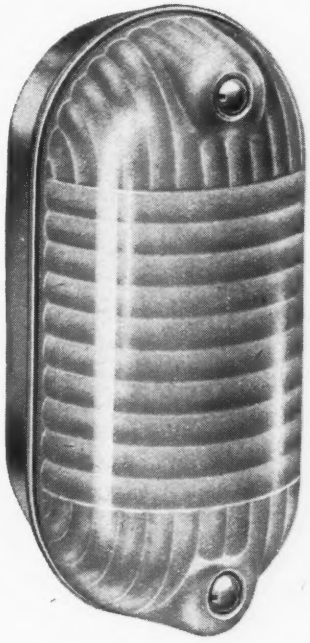
1-piece internally frosted glass of great strength, mounted on non-inter-cellular rubber gasket

2" centre knockouts
and 2 brick-width knock-outs for fixing screws



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conduit positions

Sealing compound
for conduit entry supplied with each fitting

BC lampholder
(porcelain) with each Corrilux

Alternative fixing
for lampholder position

Holds any lamp
up to 100W

Surface or semi-recessed

Through wiring
A suitable length of fibre-glass sleeving is supplied to protect cables

2 secret key screws
retain glass. Easily fixed replacement glasses are supplied with captive screws

For passages, corridors, doorways, staircases, toilets, under canopies, and all outbuildings on the farm

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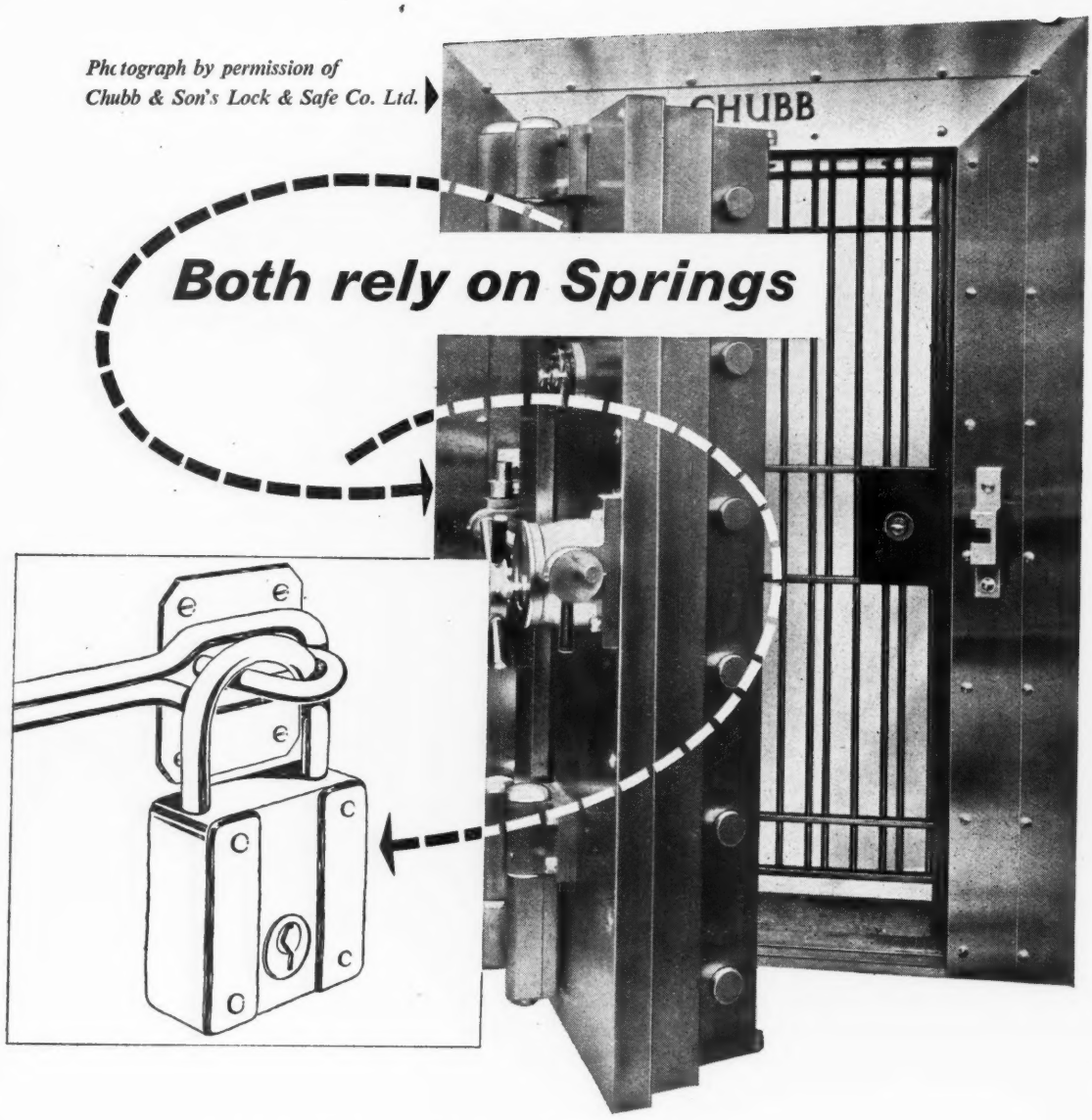

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From the high precision spring required for a strongroom door to its simpler counterpart in a padlock, the right spring for the job is essential to ensure perfect performance. When your springs are designed and made by Salter, they are just right — not the cheapest obtainable but fit to work for ever.

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Service to Engineers since 1760

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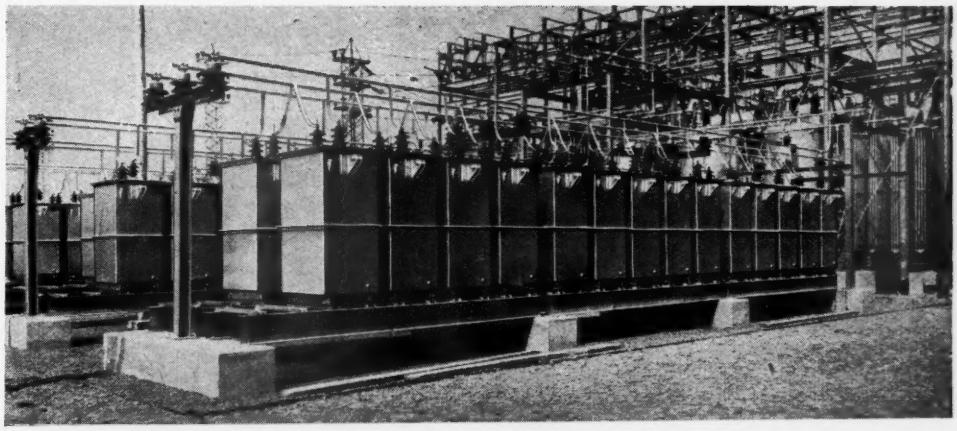
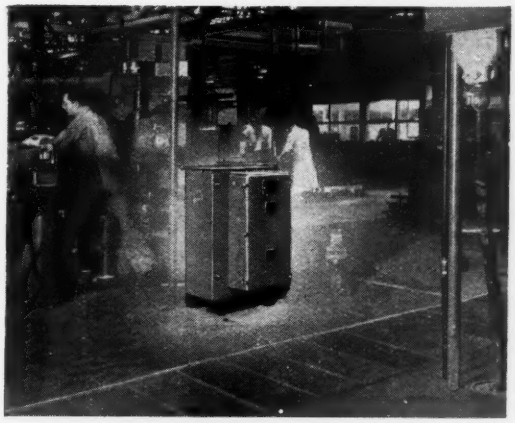


POWER SUPPLY UNDERTAKINGS This bank of BICC capacitors was supplied to the order of the Aluminum Company of Canada Ltd., and is installed on the system of the Shawinigan Water and Power Co. Ltd. It comprises eighty-one 250 kVAr tank-type units, giving a total output of 20,250 kVAr at 10,300 volts. Several banks of up to 15,000 kVAr have been installed on this and other Supply Systems in Canada.



INDUSTRIAL INSTALLATIONS Where individual correction of motors is not possible, automatically controlled capacitors connected to distribution boards result in improved voltage regulation and reduction of load on factory networks. Illustrated is a 50 kVAr automatically controlled BICC capacitor in an aircraft factory in the North of England.

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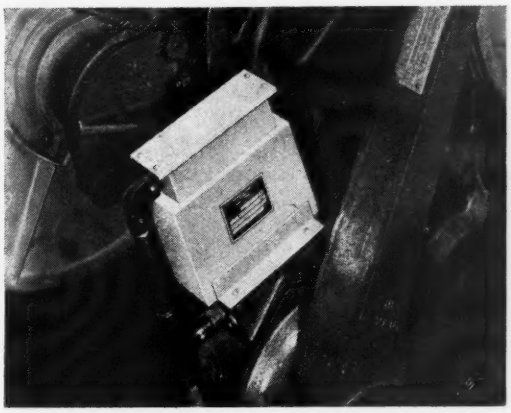
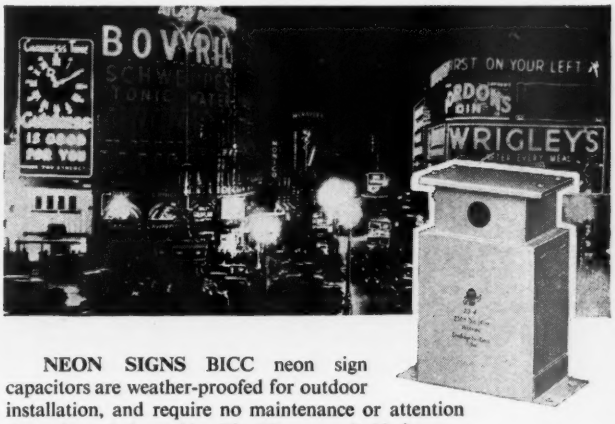


LOOM MOTORS Many thousand kVAr of BICC capacitors are now in use in mills throughout the country. The illustration shows a ½ kVAr capacitor mounted directly on a ¾ h.p. loom motor in the Woodbine Mills of Thomas Walton Ltd., Burnley.



NEON SIGNS BICC neon sign capacitors are weather-proofed for outdoor installation, and require no maintenance or attention throughout their working life. They are suitable for continuous duty on single-phase a.c. circuits up to 250 volts.

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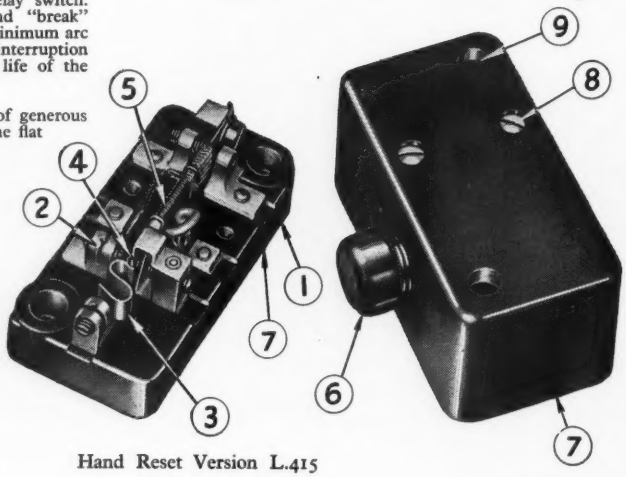

Hand Reset Version L.415
Automatic Reset Type L.413
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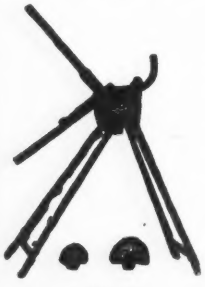

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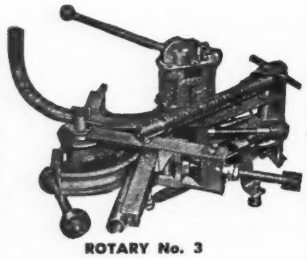

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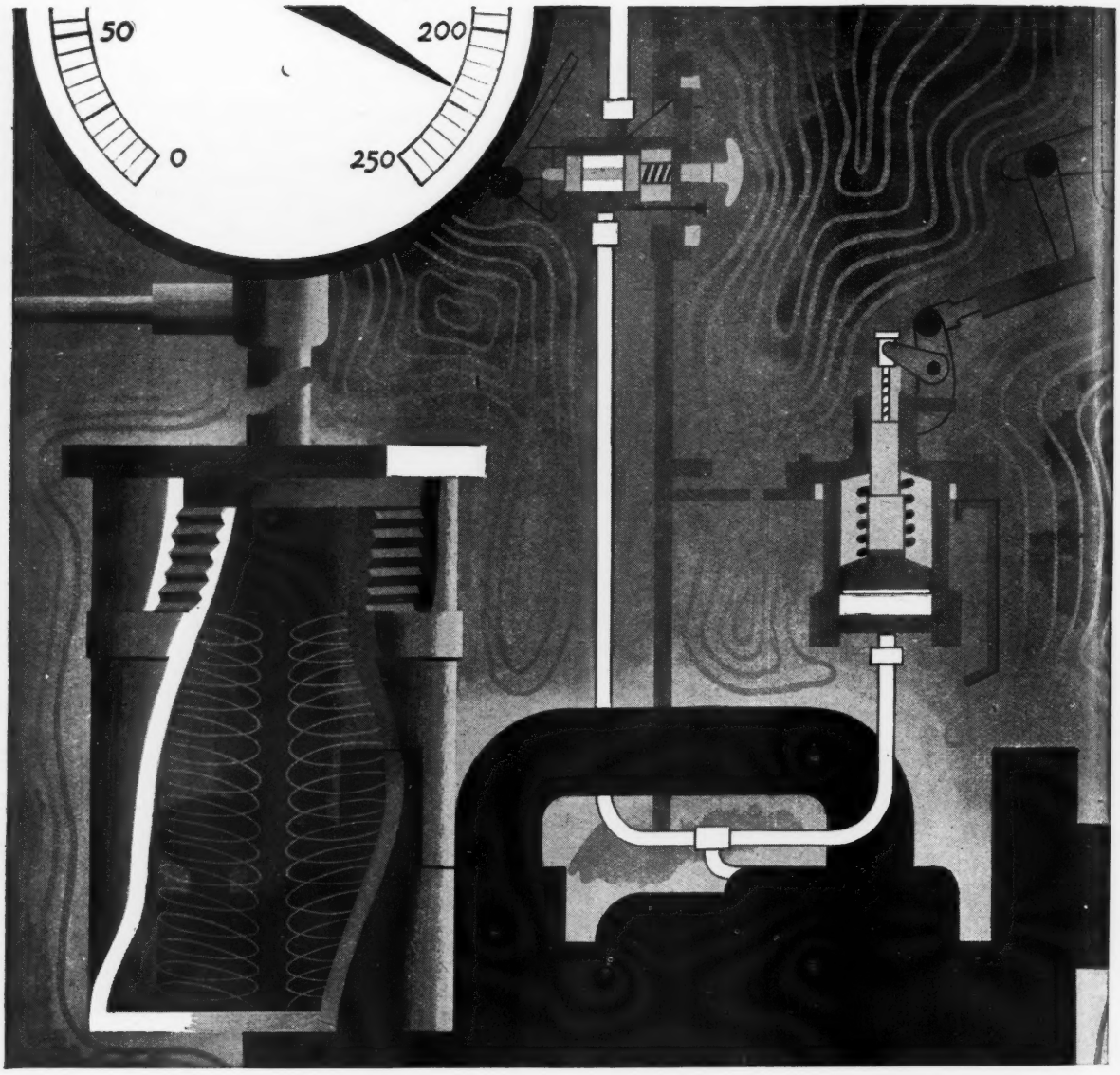

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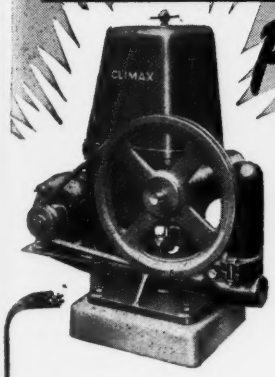

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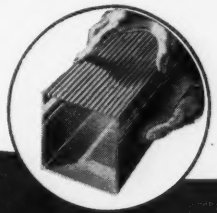

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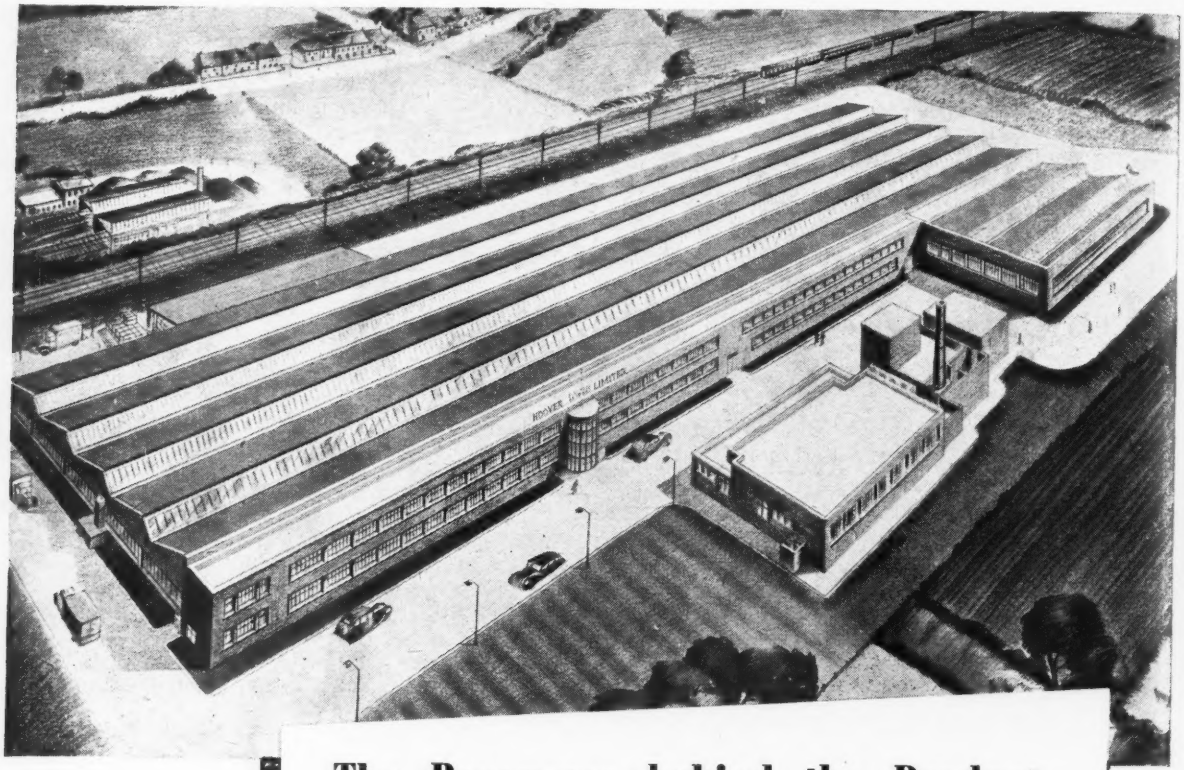

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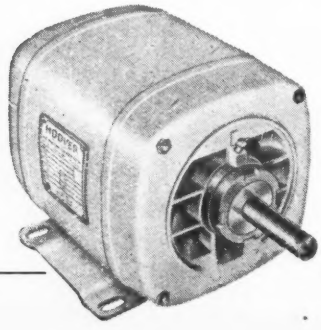

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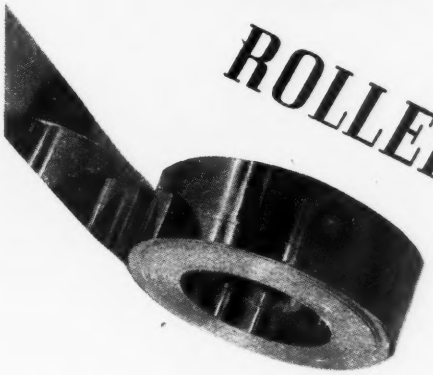

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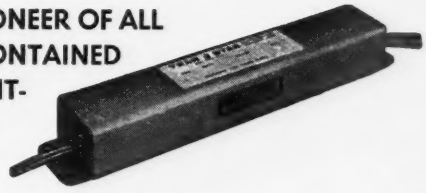

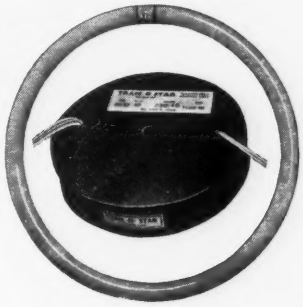

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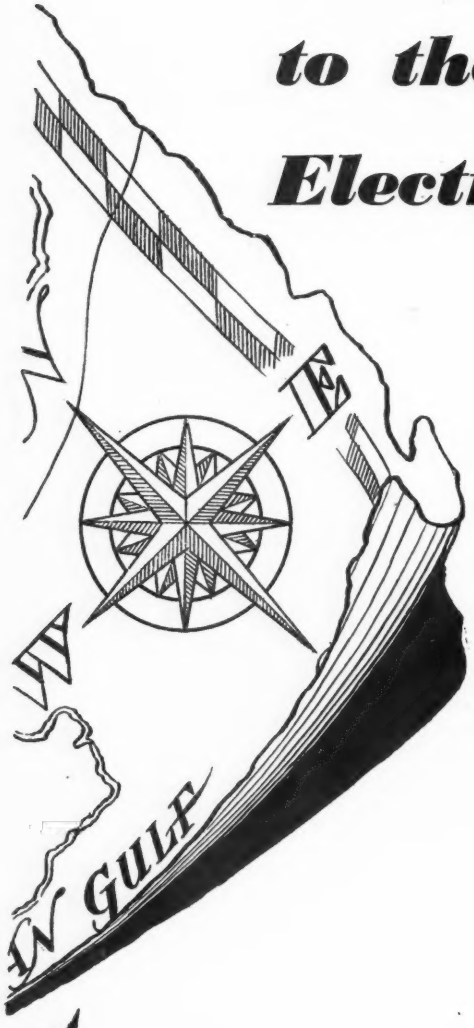

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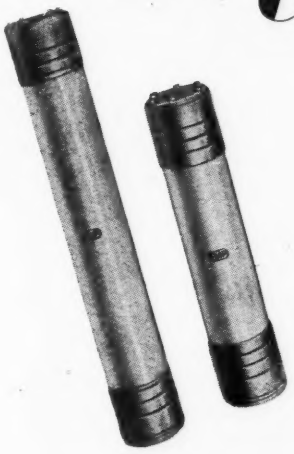

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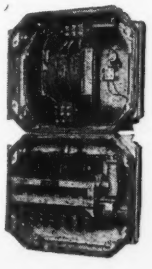

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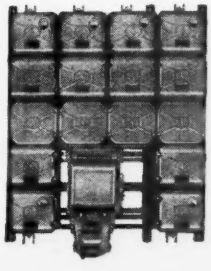

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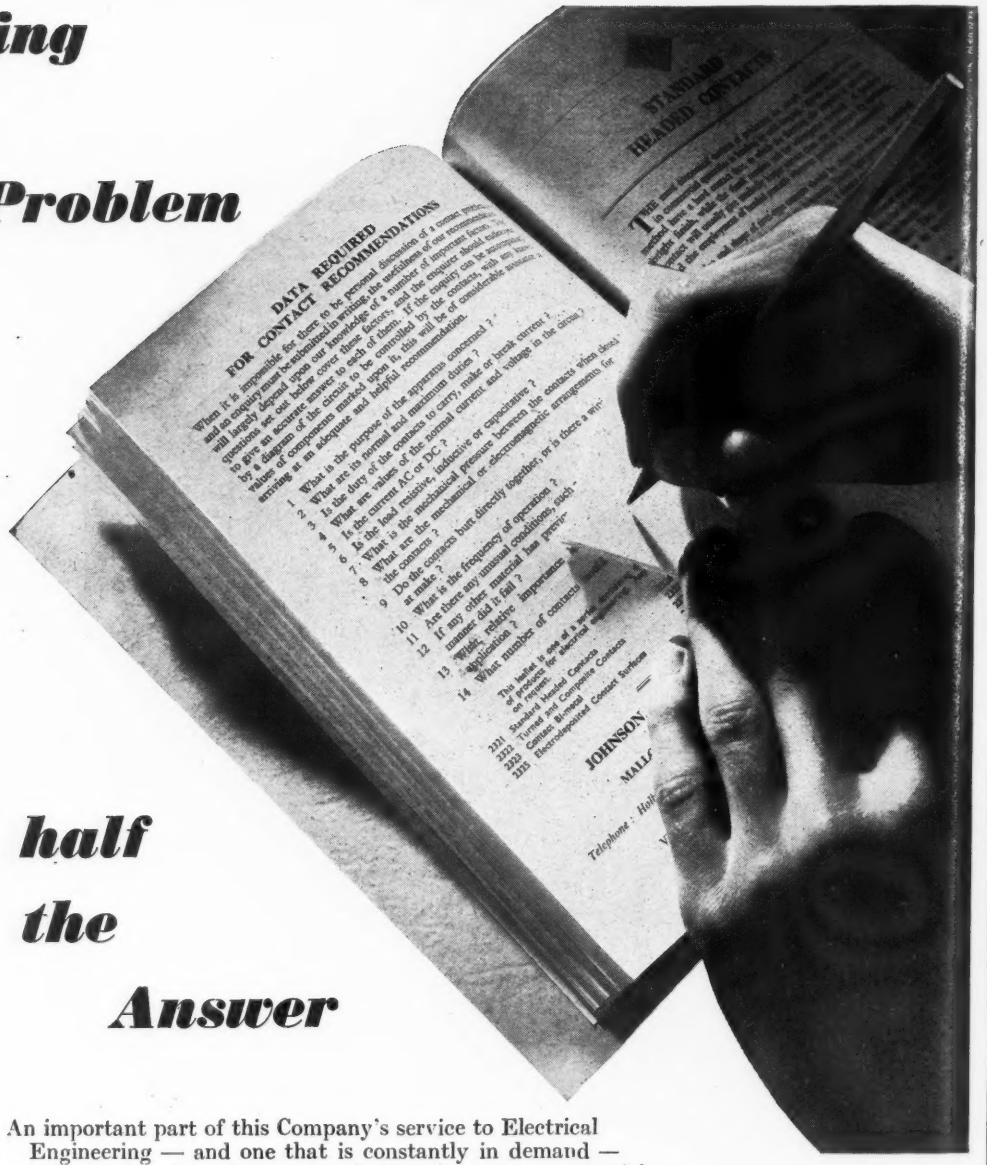

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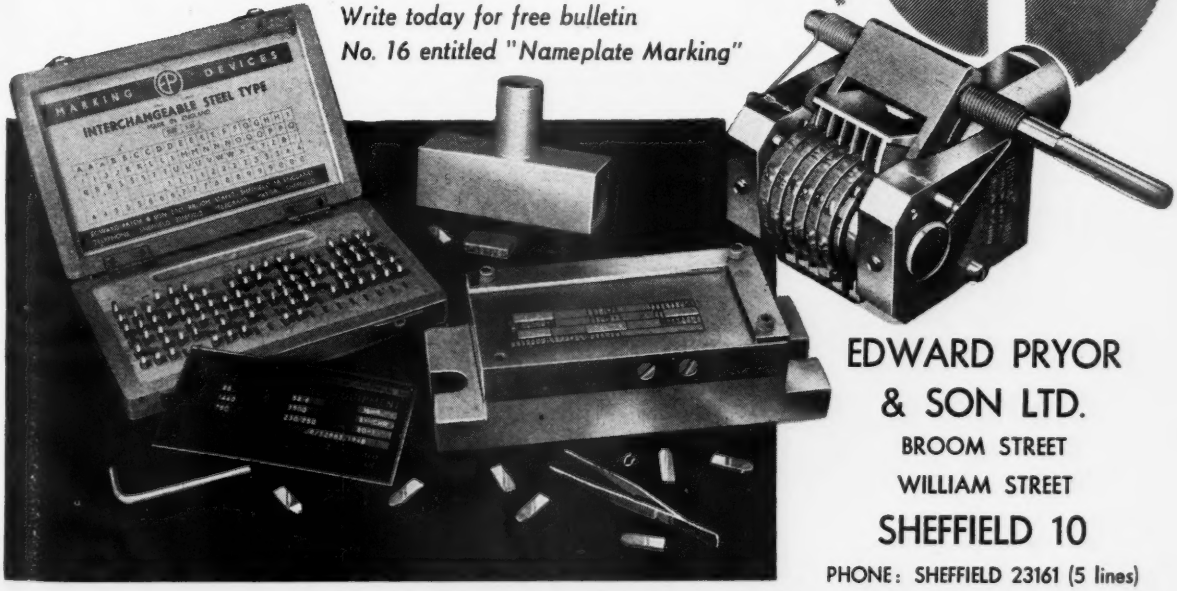

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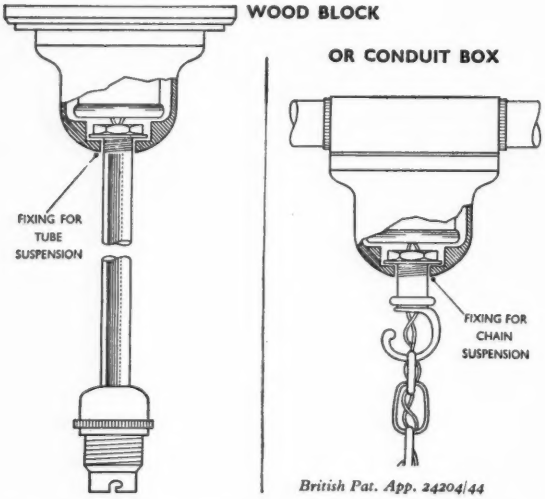

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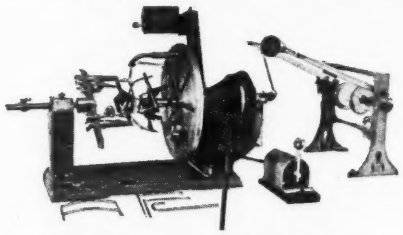

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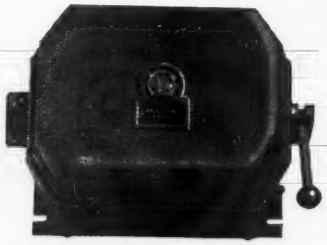

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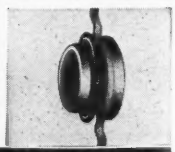

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Both round and rectangular models of moving iron, moving coil, A.C. rectifier and H.F. thermocouple types are offered. In the range of rectangular instruments, which have been introduced to give the advantage of long, easily-read scales and to harmonize with rectangular panels, certain models are available with illuminated dials. Full particulars of types and ranges available are to be found in leaflets List Nos. W.1 and W.2, copies of which are available on request.

Rectangular panel instruments are available with scale lengths of 2·5″, 3·2″, and 4·2″.

These offer the advantage of an increase in scale length of approximately 50% over their equivalent round models, for which they can be used as direct replacements using the same panel fixing holes.

Round models are housed in cases of 2″, 2½″ and 3½″ diameter and have scale lengths of 1·7″, 2·1″ and 2·8″ respectively.

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SPARTAK play under REVO FLOODLIGHTS

Russian players train at Tipton

Because of the excellent facilities provided by the Revo Electric Company's Floodlit Sports Arena at Tipton, the Russian Spartak team selected this ground to carry out their training (in preparation for their match with Wolverhampton Wanderers) and found the lighting to their entire satisfaction.

The experience of close on half a century in the manufacture and design of lighting equipment enables the Revo Electric Co. Ltd. to offer a first-class service and many leadings clubs throughout the country have chosen Revo Floodlights to illuminate their grounds.

The company's technical staff is available to advise on all aspects of floodlighting and details and catalogues will gladly be sent to interested authorities who are invited to forward their enquiries without obligation.

Top : Wolverhampton Wanderers playing Revo Electric Co. Ltd. on the latter's own ground.

Centre and Below : Members of the Russian team taken during their training under Revo Floodlights.

REVO REGD.

FLOODLIGHT EQUIPMENT

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BRANCHES AT: LONDON, MANCHESTER, GLASGOW, LEEDS, CARDIFF, NEWCASTLE-ON-TYNE, BELFAST, DUBLIN

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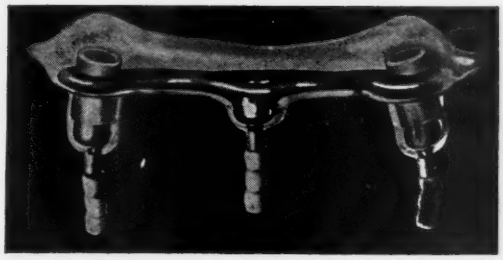

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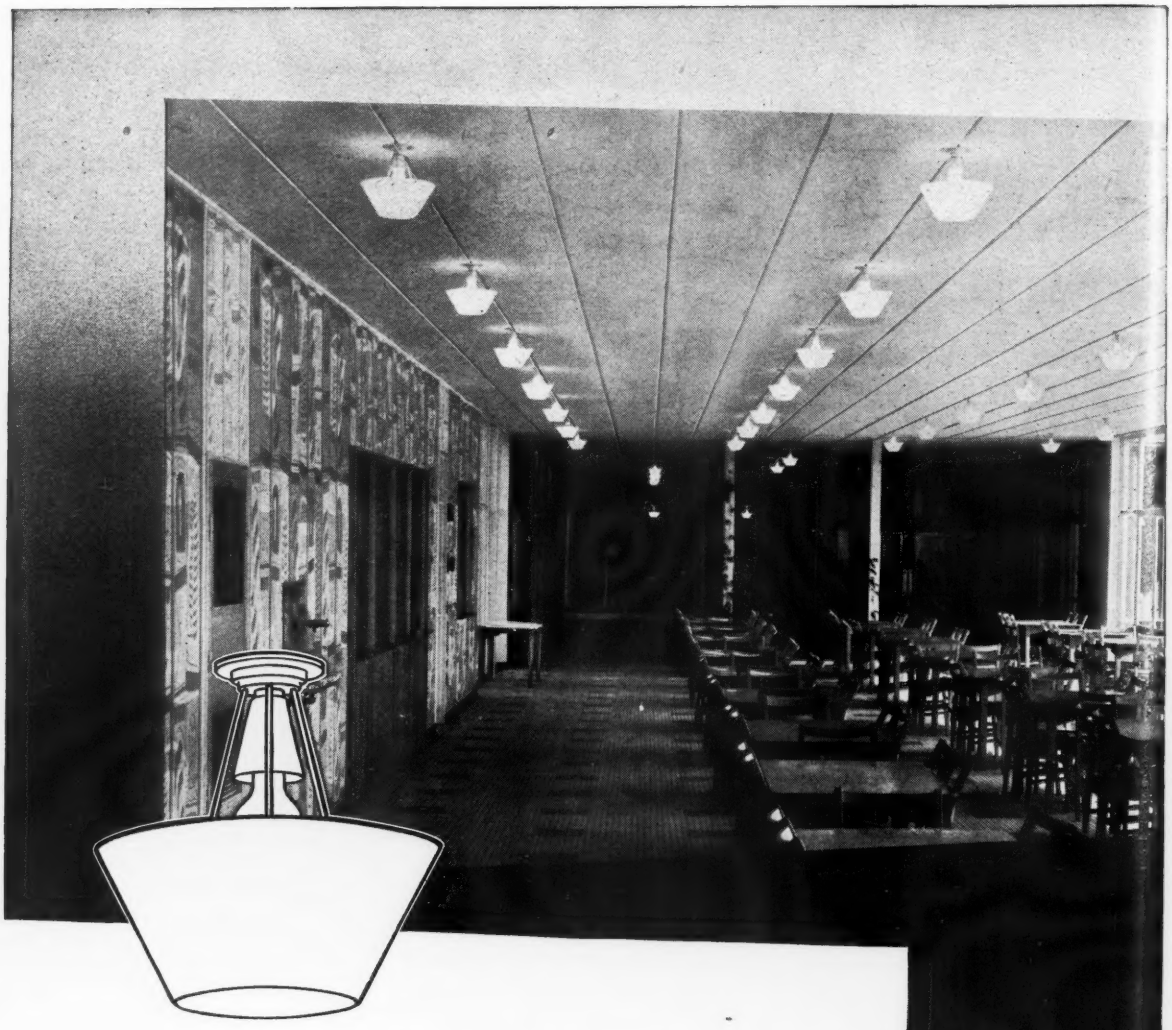

'PERSPEX' lighting fittings for a new school

GREAT interest has been aroused by the architectural ideas and planning of the new St. Crispin's School at Wokingham. This building was designed by the Development Group, Ministry of Education and it is significant that 'Perspex' was chosen for the specially designed lighting fittings manufactured by Hartley Electromotives Limited.

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is the registered trade mark for the acrylic sheet manufactured by I.C.I.

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COMPLYING WITH B.S. 116: 1952

"ELLISON" 660 VOLT DISTRIBUTION SWITCHBOARDS
are available with tested circuit breakers in current rating sizes of up to 2400 amps and 45 M.V.A. rated breaking capacity.
They are designed for quick and safe maintenance; flush mounted instruments facilitate easy cleaning.

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LIMITED
BIRMINGHAM ENGLAND

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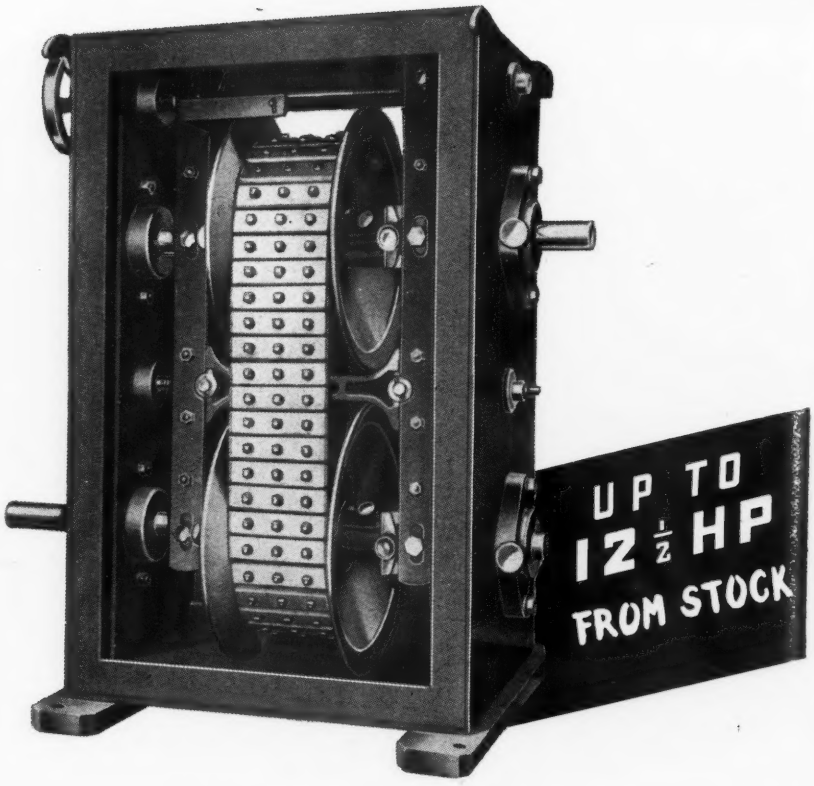
MAKE THE MOST OF YOUR POWER WITH *Crofts*



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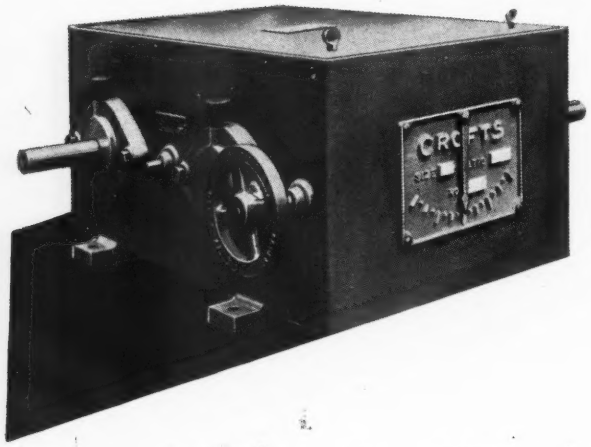

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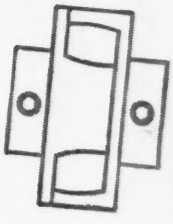
Attachment to shafts by means of a suitable screw in each half-body: there are no projections.



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This new large mains signal lamp has been designed for use with standard 15 watt B.C. Pigmy Lamps, for all mains voltages up to 250.

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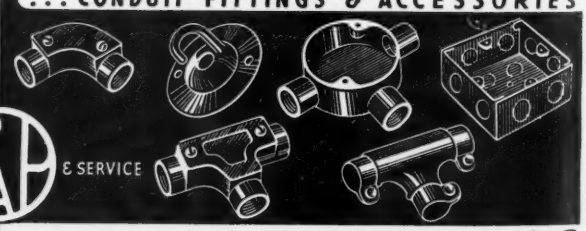

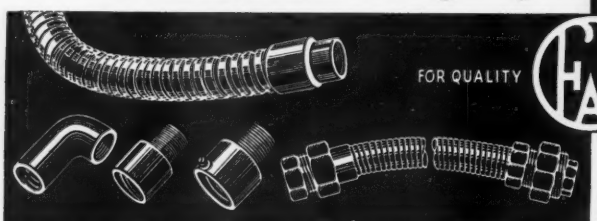

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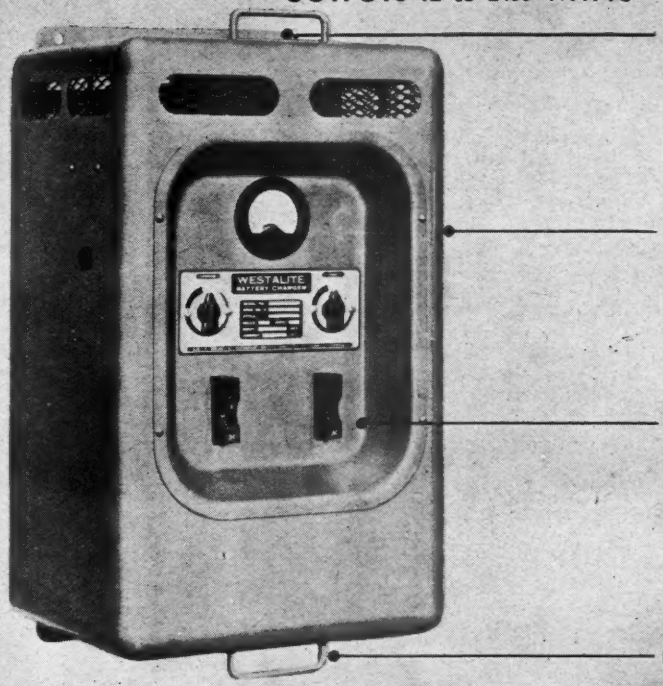

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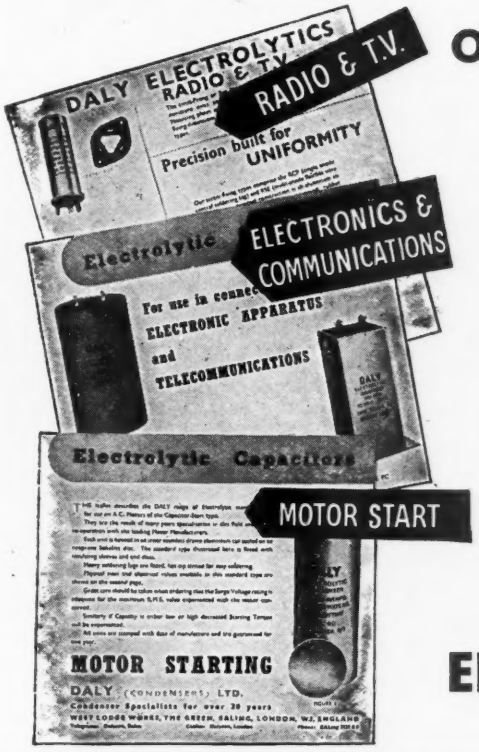

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These three leaflets fully describe the wide range of standard DALY electrolytic capacitors. In general, the types listed will cover most requirements. Where specifications outside this range must be met, however, DALY will design and make special units to meet specific needs.

Behind DALY capacitors there lies 20 years of making only electrolytics, highly specialised experience which engineers throughout the world are finding invaluable, and which is readily available to you.

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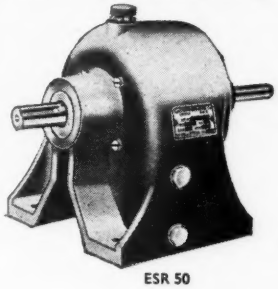
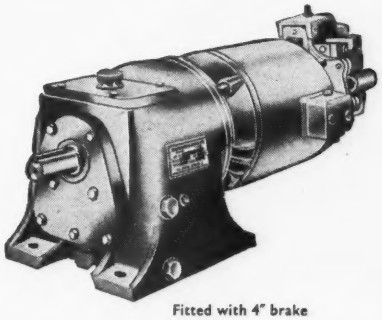


ESR 50



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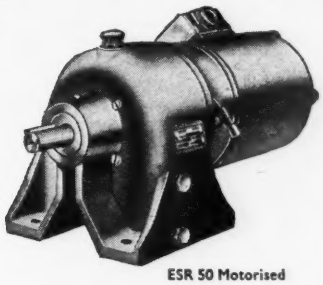

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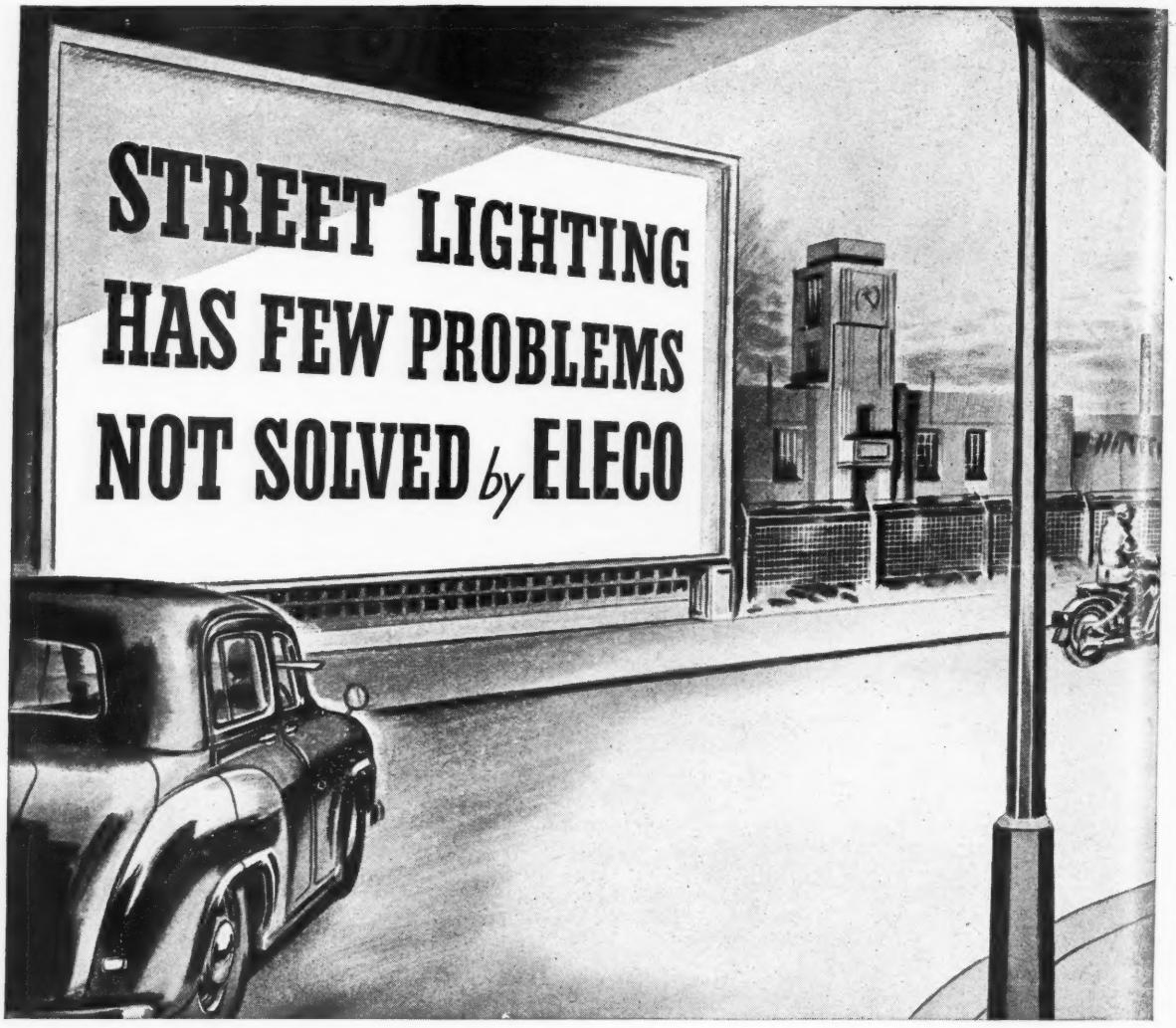

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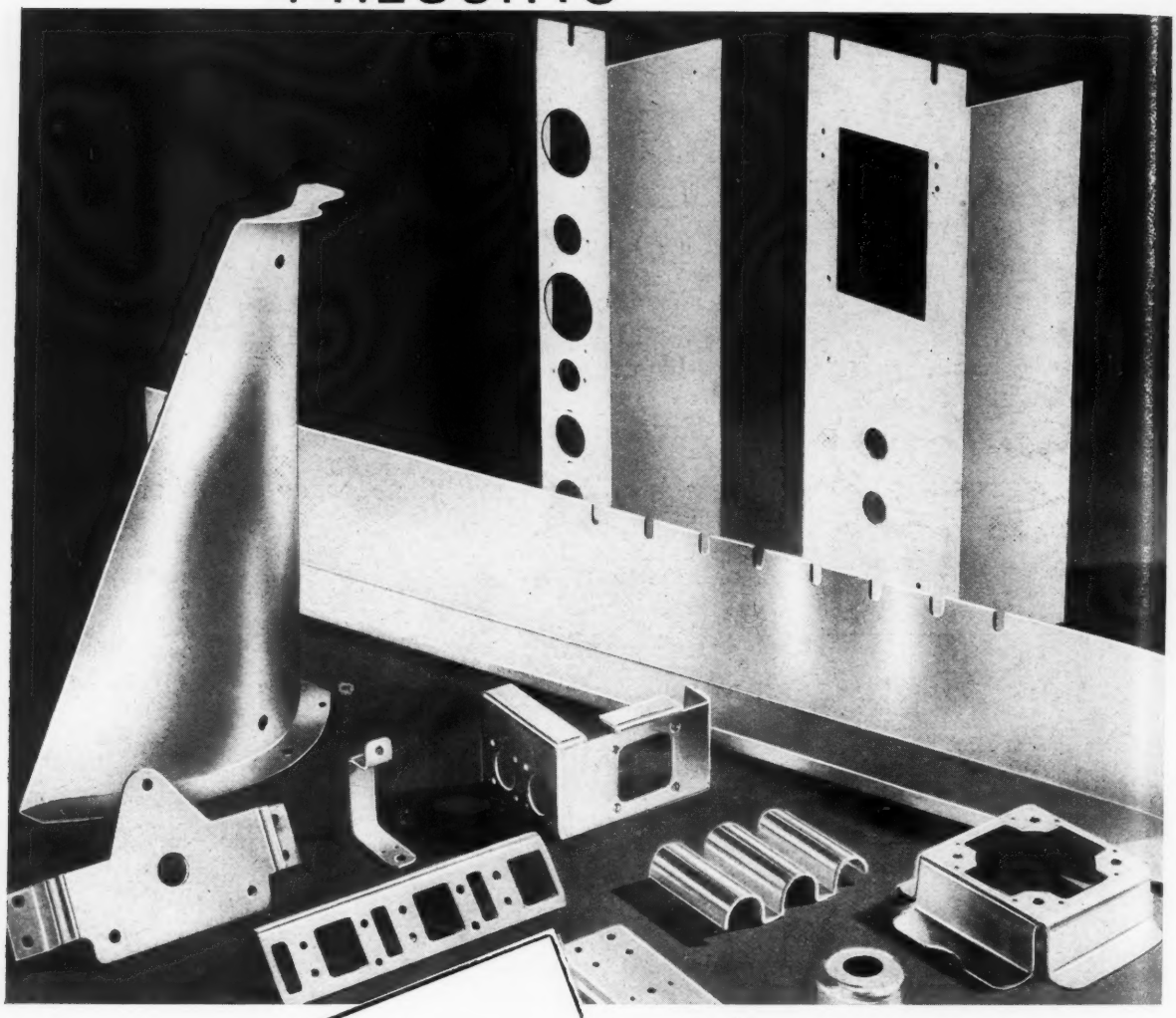

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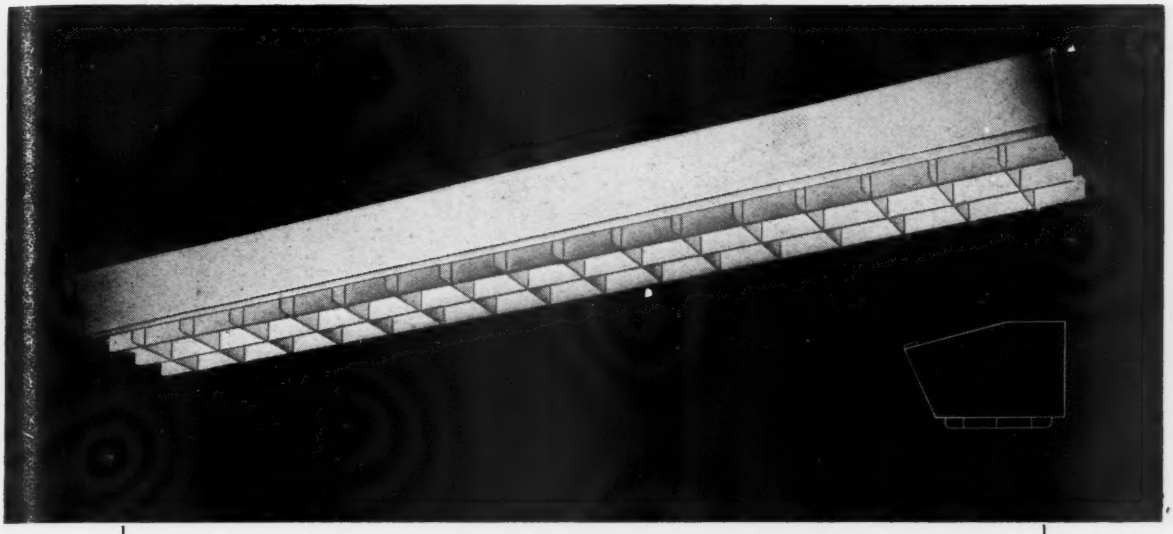

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provides efficient lighting now and valuable flexibility for future changes. Designed by Ediswan Engineers in conjunction with Messrs. Fairbrother, Hall & Hedges, Chartered Architects, fittings use one or two tubular fluorescent lamps of any standard rating according to the local intensity required. The special CONTINUOUS channelling on which they are mounted gives the Engineer the facility of altering the position of fittings with any change in working conditions without disturbing the continuous channelling and consequently at minimum cost.

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EDISWAN

Fluorescent Lighting Equipment

PUBLICATION No. LE 1768A ON REQUEST

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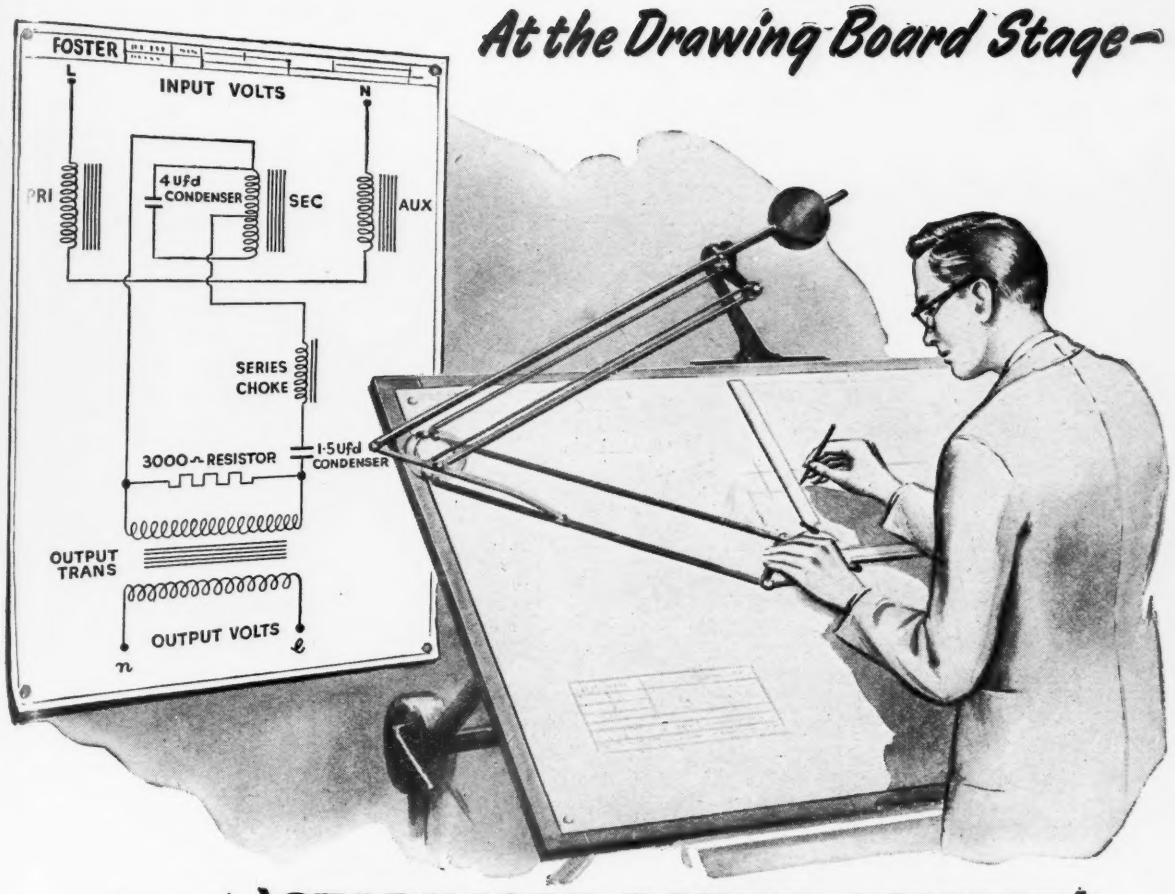
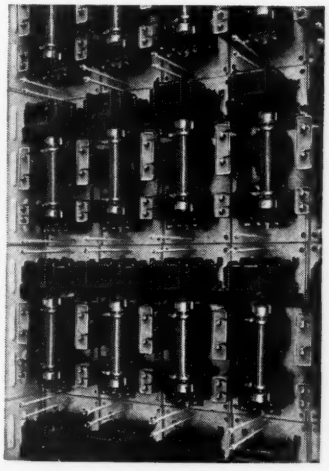


plan the 'STABILISED POWER SOURCE' *of your Equipment...*



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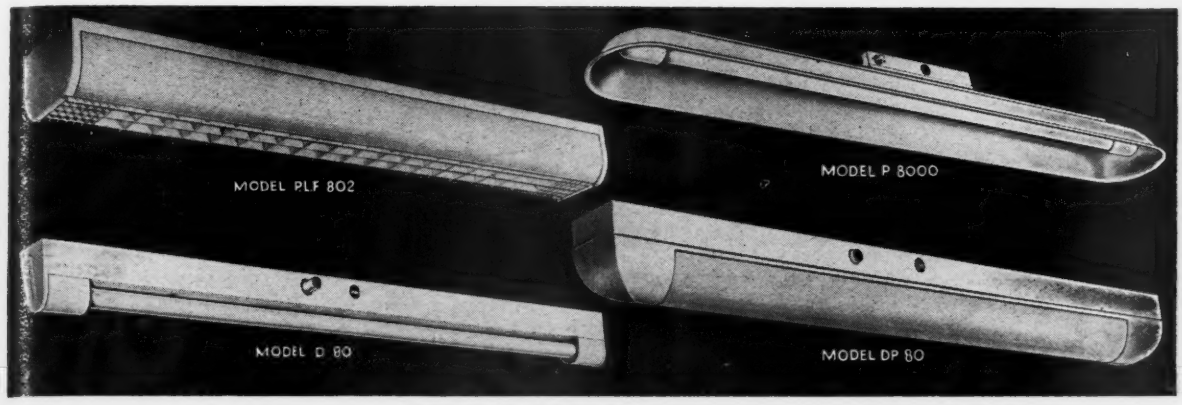

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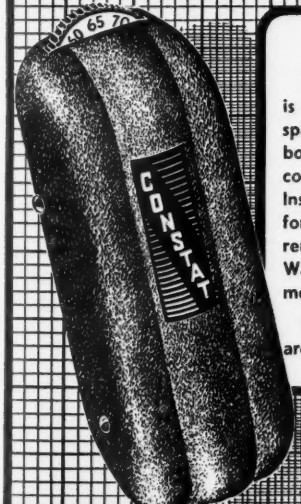

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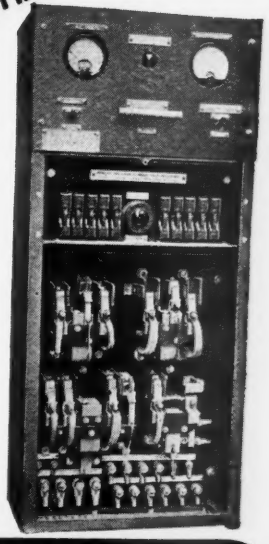

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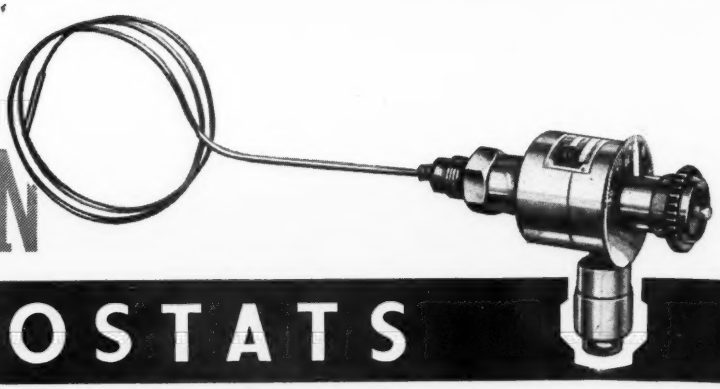

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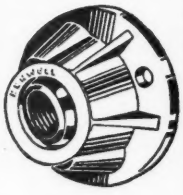

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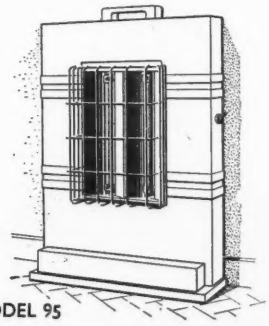

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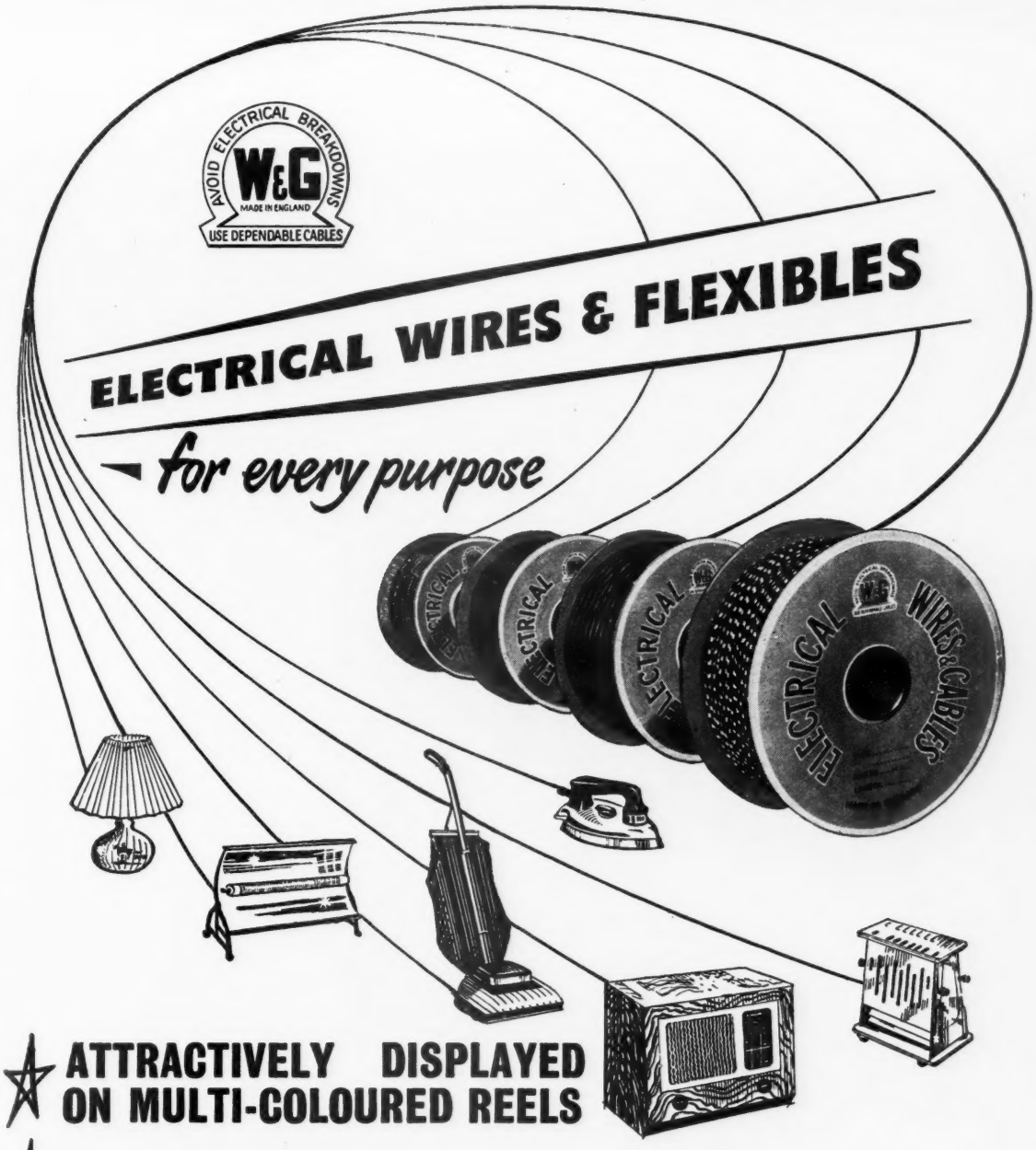

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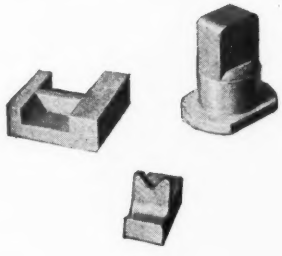

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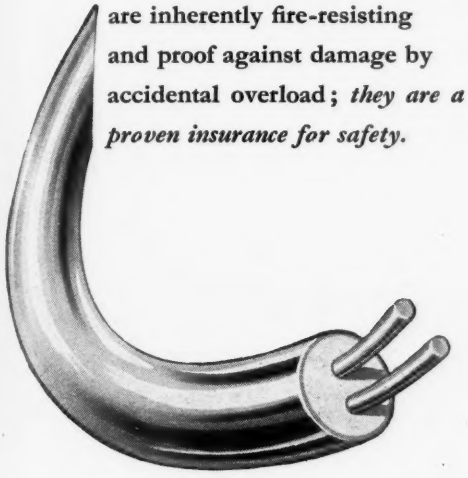

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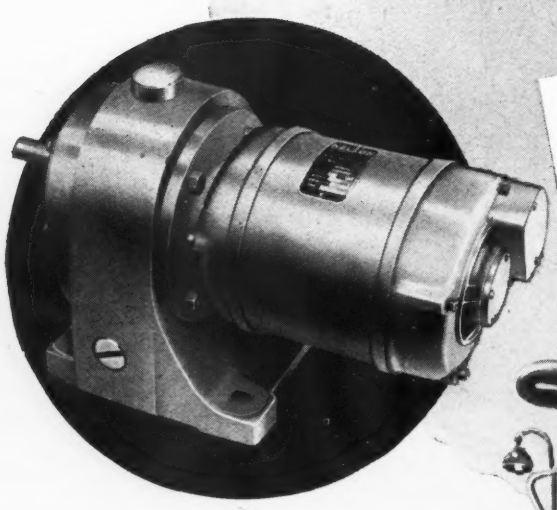

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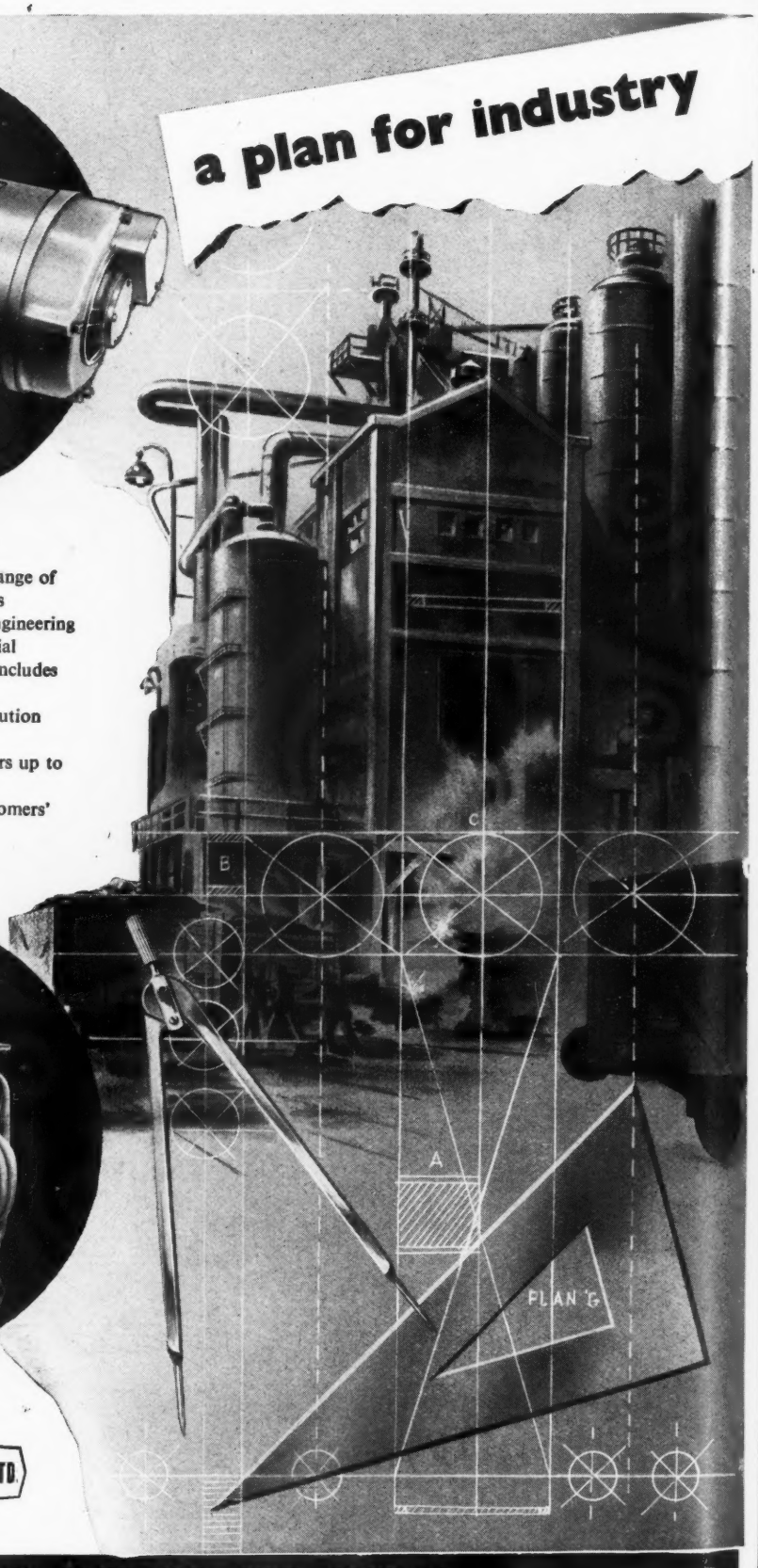

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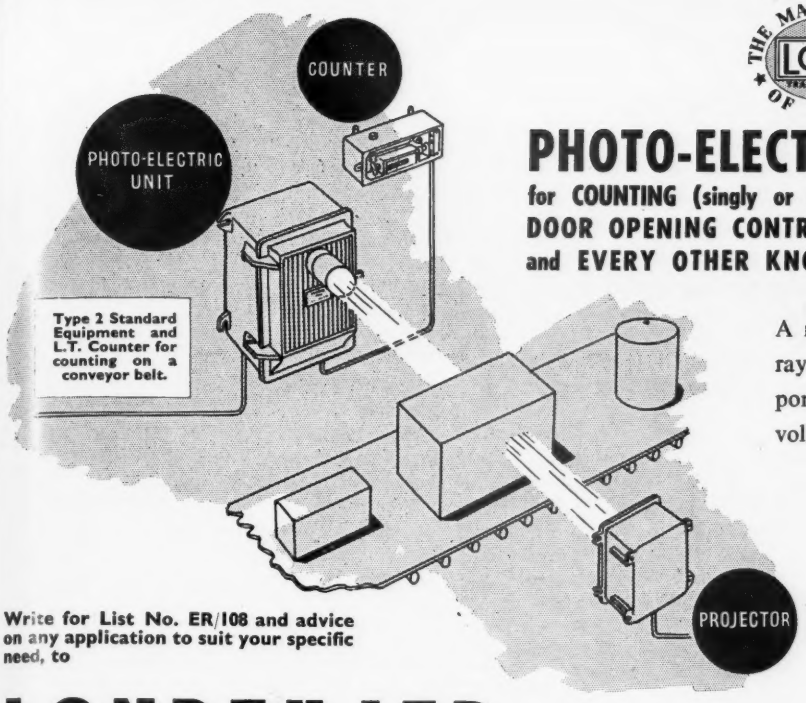

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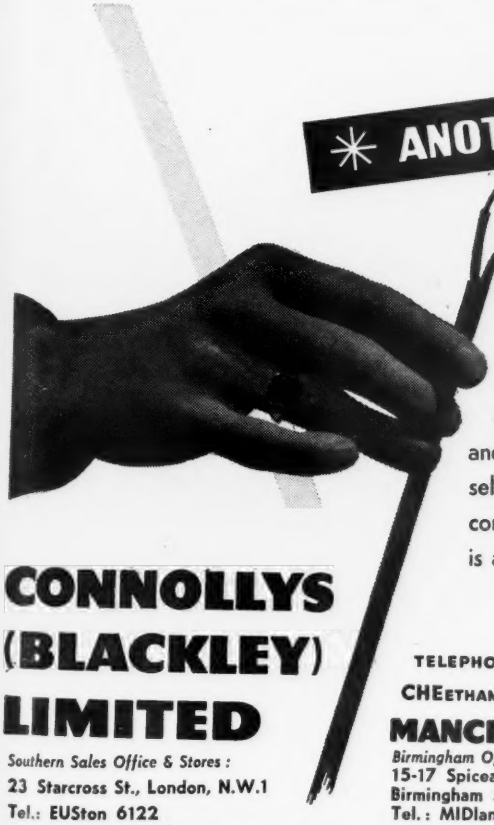

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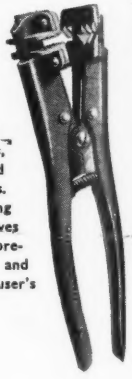

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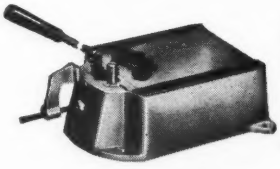

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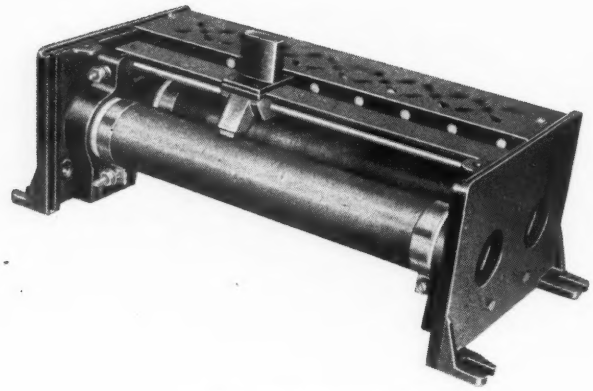

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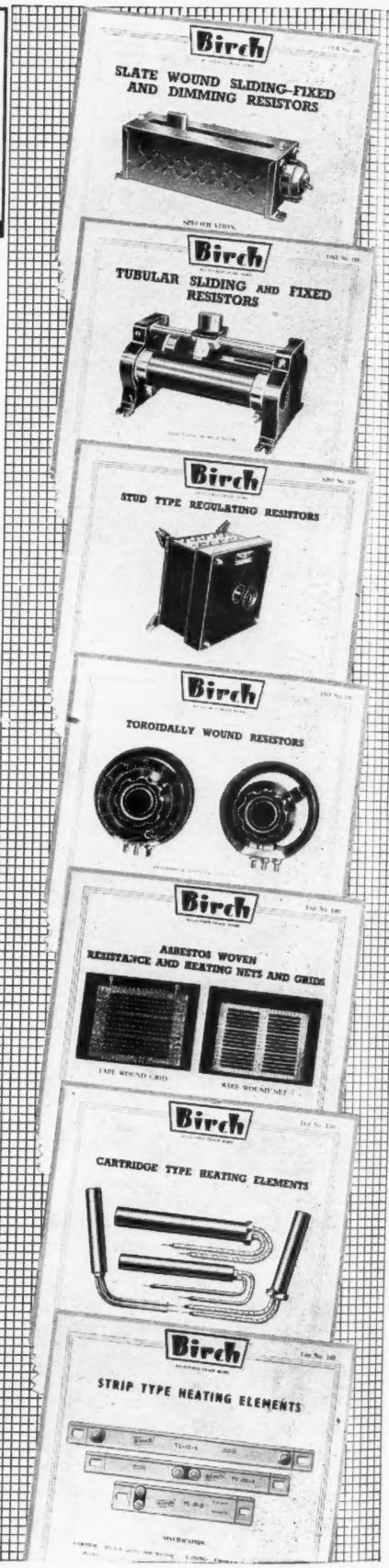

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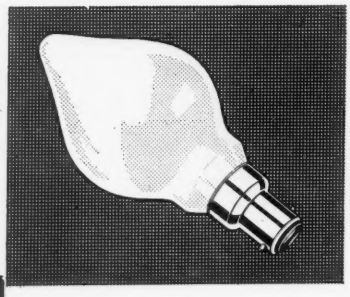

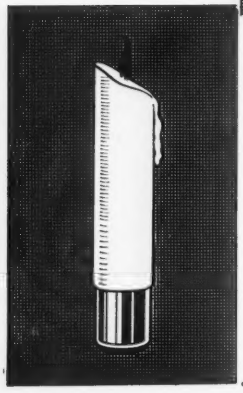

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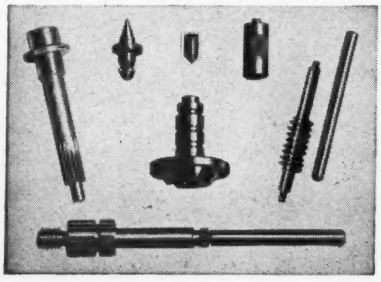

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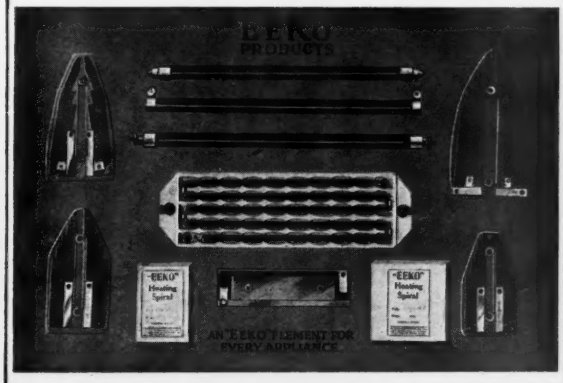

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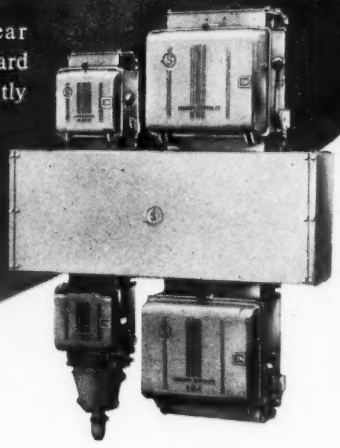

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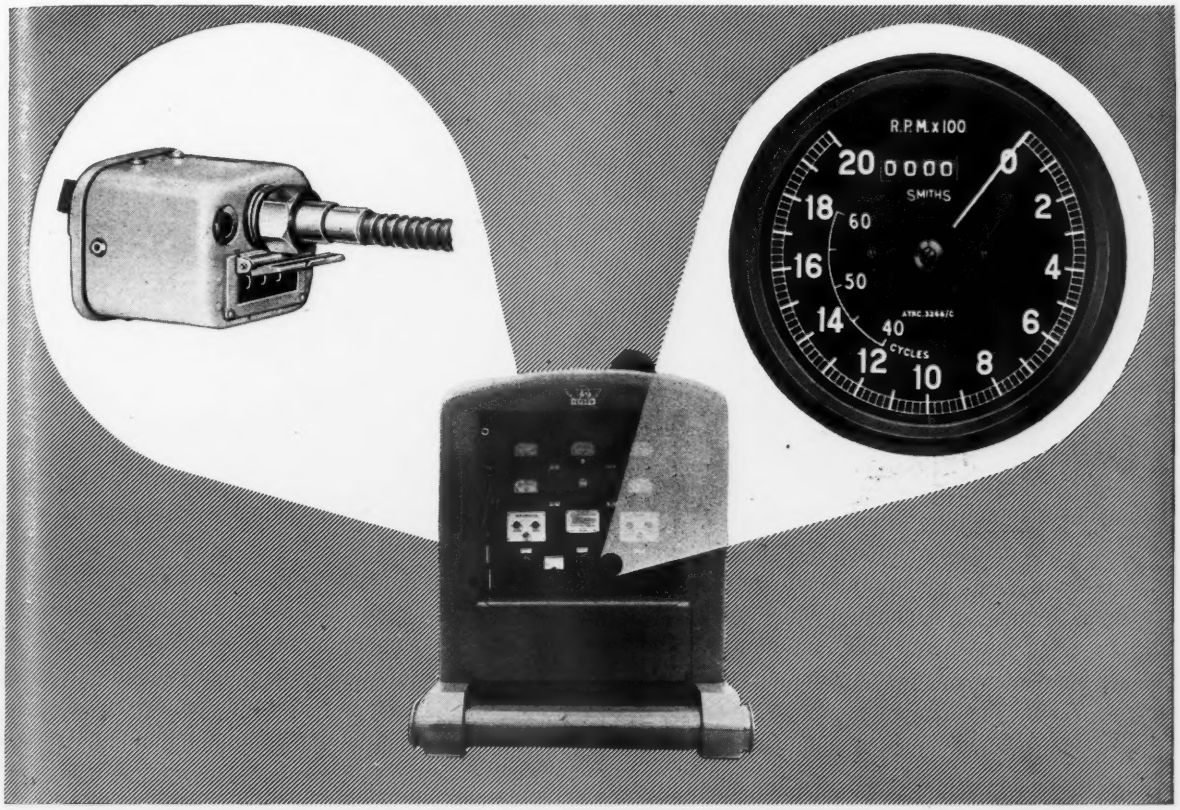

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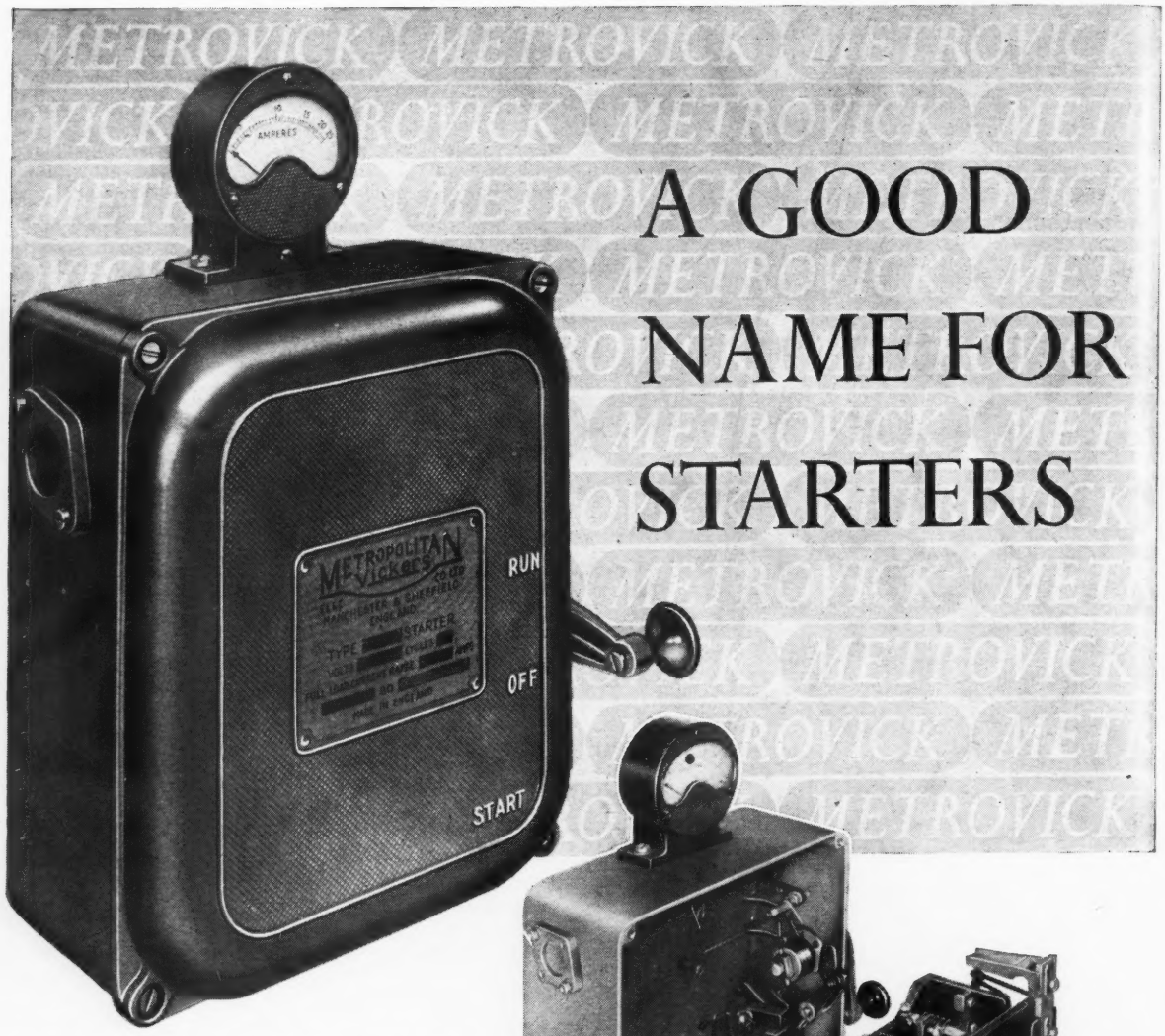

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17 DECEMBER 1954

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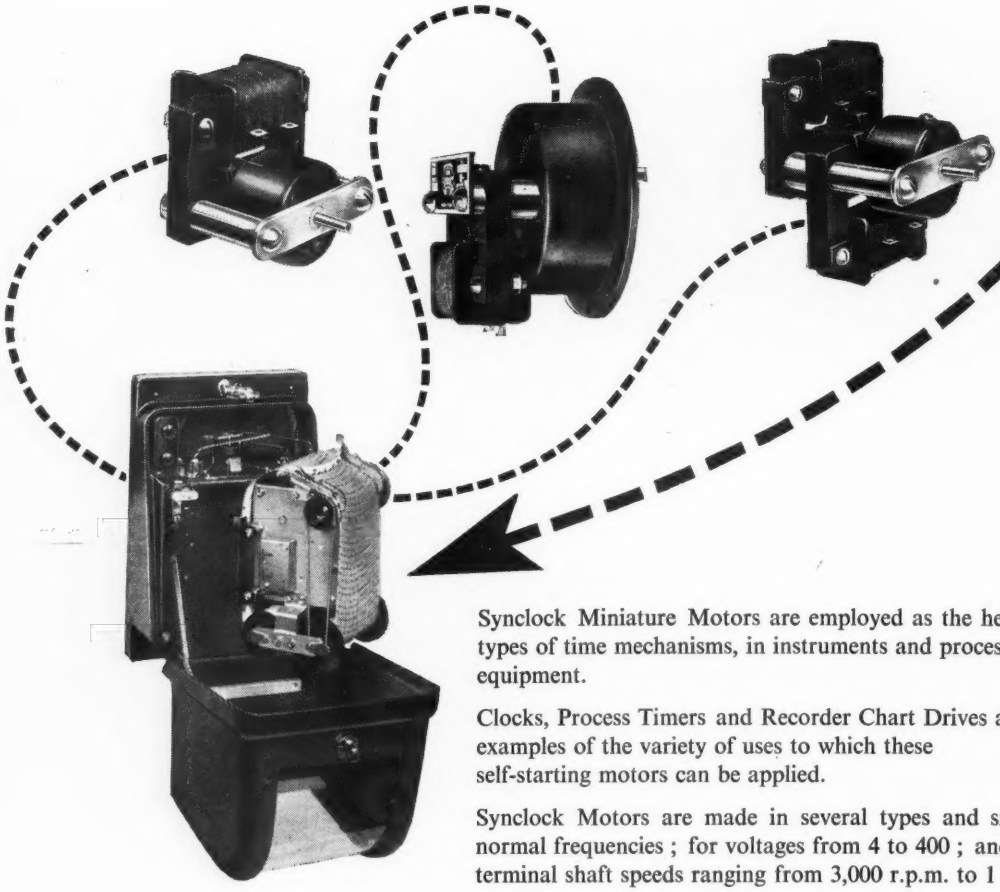

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17 December 1954 Vol. 155 No. 25 Established 1872

Shortage of Technologists

ELSEWHERE in this issue we report various proposals which were announced by the Government last week as a contribution to the solution of the " national emergency " which we believe the present shortage of technologists to be. The Government appears to favour the absolute rejection of the idea of forming separate technological universities; the closer linking of the technological institutions with the existing universities; increases in the annual grants for technical education; additional expenditure on the university building programme; and various specified large-scale expansion schemes.

In our view these proposals are sound, particularly the rejection of the idea of separate technological universities. We wholeheartedly agree that " higher technological education must be closely linked with other university studies." The very idea of separate technological universities cuts right across the basic purpose of the university which is to produce breadth of knowledge as distinct from the comparative narrowness of technology. University training should not be vocational.

We think the Institution of Electrical Engineers makes clear this point in its definitions of the professional engineer and the technologist. It says, in effect, that the professional engineer is fitted by reason of his academic training to deal with the fundamentals of science. This is much the same position as is the case in the medical world where the student goes to a university to study medicine and then afterwards enters a hospital to learn how to apply it. Linking the technical college with the university produces two outstanding advantages. Firstly the study of technology can be based on the theory and advances in the theory, for which the university is responsible, and secondly, any points which come to light through study of the application can be referred back to the scientist who will be able to put them into perspective against the whole field of science and this may lead to further discoveries on the theoretical side.

An outstanding omission from the Government's proposals is a way of dealing with the lamentable state of affairs which results in an insufficient supply of science students from the schools to the universities and technical colleges, although it is true that in announcing the proposals in the House of Lords Lord Salisbury stressed the importance of this point. We feel so strongly that this is the crux of the whole question that we refer our readers back to our leader " A National Emergency " and the article " Dearth of Technologists," both of which appeared in the *Electrical Review* of 3rd September. Finally we emphasize, as did Mr. W. K. Brasher, the secretary of the Institution of Electrical Engineers, in his letter in our issue of 10th September that the electrical profession and industry are likely to be more gravely affected than most, if not all, of the other fields of technology.

COST OF GAS WASHING

It is ironical that the electricity supply industry, which has done so much to clear the air, and can do so much more if its charges remain reasonable, should be threatened with an expense for gas washing which would probably increase generating costs by 12 per cent. That is the figure put forward by the British Electricity Authority in commenting on the Beaver Committee's recommendation that gas washing plant should be installed in all new power stations. It is no argument against the recommendation to say that its adoption would still leave three-quarters of the sulphur problem unsolved. Solution to the extent of a quarter would be something; the point is whether better results could not be achieved in other directions for the same expenditure (from £140 to £250 million). It is another thing to argue that it has not been established that gas washing can be effectively introduced. The B.E.A. undertakes to abide loyally by the Government's decisions, whatever they may be (as of course it is bound to do). It is easier for the Government to direct that the power stations, which belong to a public authority, must have gas washing plants than for it to regulate and restrict the domestic consumer or private industrialist. But further consideration is desirable, and necessary, before the Beaver Committee's proposal is adopted. In the meantime another of the Committee's recommendations—the abolition of purchase tax on electric heaters, to encourage the substitution of these for coal fires—is easier to implement and should be accepted by the Government.

ALTERNATOR TESTING

The increasingly heavy ratings of modern alternators add to the difficulty of providing enough mechanical strength in stator end-windings to withstand electromagnetic forces due to short circuits across the terminals. In their I.E.E. paper, summarized on another page, Messrs. J. B. Young and D. H. Tompsett question the need of specifying short-circuit tests at full voltage. From the evidence given in the paper it appears that such tests are more truly applicable to relatively small machines coupled direct to busbars for supplying local loads than to the larger units of to-day that are usually connected to the grid through step-up transformers to serve possibly remote loads. Moreover, so severe a test may overstress the insulation, resulting later in failure in service. The authors' proposal that, if required, the 100 per cent test should be applied not to the alternator itself but to a modified replica should therefore work out to the advantage of the user.

SOUTH AFRICAN PROSPECTS

Political events in South Africa have naturally caused British exporters to wonder about the future of trade with the Union. It seems, however, that economic rather than political conditions will govern that future. After the war shortage of foreign exchange forced the Union Government to control and restrict imports and this was coupled with a need, or desire, to develop secondary industries. As a consequence the main emphasis was put on imports of capital equipment and raw materials, to the detriment of exporters of consumer goods. Speaking at the members' annual luncheon of the British Engineers' Association last week Mr. Gerhardt Jooste, High Commissioner for South Africa in the United Kingdom, referred to the altered conditions but assured his audience that South Africa would remain one of this country's best markets if certain conditions were fulfilled—mainly the quotation of firm prices and adherence to delivery dates. He said that the rate of relaxation of controls on imports depended on the trend of sales of South African products abroad and the rate of investment of overseas capital. Since the war British capital investment in the Union has amounted to between £400 and £500 million.

ARC OR OPEN HEARTH FURNACES

We suspect that the installation of the 60-ton electric arc furnace which is described elsewhere in this issue may have some long term significance in relation to the Battelle Report referred to in our issue of 5th February last. This report showed that it had become economical to use arc furnaces in the United States for the production for some of the lower carbon steels as against production in open hearth furnaces. When the Report was published we saw how extremely important it would be to the electrical industry in this country if some of the lower qualities of steel were made by the arc furnace, and to give emphasis to this contention we sought, in co-operation with the Yorkshire Electricity Board, to obtain the views of the electricity supply industry, the electric furnace manufacturer and the steelmaker. We had no difficulty in finding people to express the views of the supply industry (*Electrical Review*, 14th May, 1954) and the electric furnace maker (*Electrical Review*, 18th June), but we were unable to persuade a steelmaker to give an opinion. We feel, however, that the new situation is voiced by the owners of the new arc furnace when they say that it will be occupied with the production of types of steel with a relatively low alloy content, and that a more even balance now exists between the company's open hearth and electric steel making resources. Exactly how consumer demand and fuel costs will influence these plans in the future one way or the other is a matter for conjecture and future plans for plant development should be flexible.

WASH BOILERS

Continuing our series of illustrated surveys of domestic electrical appliances, next week (24th December) we shall be dealing with wash boilers. Particulars to be given in tabular form will include details of the type, size, tub capacity, loading, method of control, finish, price, etc. Because of the growing popularity of this feature the demand for the *Electrical Review* is heavy and orders for additional copies should be placed without delay. In the next survey (14th January) the subject will be electric irons

Factory Electrical Layouts

Problems Involved in their Planning, Execution and Revision

By R. SMILLIE, A.M.I.E.E.*

THE work of planning and installing schemes of electrical distribution for industrial purposes is fairly well known to many of the readers of this journal and it is not proposed in this brief article to dwell on the various stages of detailed design and execution necessary, but rather to touch on some aspects of the work, which if overlooked or given insufficient thought may prove, to say the least, a minor irritation if not an outright handicap either during the early stages of the installation or its subsequent life.

Planning and Execution

Seldom, when considering the site for factory development, is one fortunate enough to have all main services, i.e. electricity, gas, water, sewers, available to such a degree that large scale reinforcing of local networks is unnecessary. Generally, since the passing of the Distribution of Industry Act, 1945, the availability of manpower has been a predominant factor in the location of industry. While not disagreeing with this policy, I think this often results in the need for considerably augmenting the local electricity networks in the vicinity of the selected site.

Load Determination

Assuming that a supply has to be taken from the electricity authority, one aspect of the problem which immediately arises for the designer is the question of anticipated load requirements. The seriousness of this estimate to the supply authority can be readily appreciated, having regard to the present day heavy capital cost of development, and correspondingly to the potential consumer who will be called upon to give, as a minimum requirement, a guarantee of revenue return to the supply authority over a period of years or, as sometimes happens, an actual contribution to the capital expenditure in addition to any guarantee that may be required.

In deciding his electricity requirements the user invariably tends to over-estimate. The assessment of a reasonable estimated maximum demand, which governs the amount of work and cost to the Electricity Board in providing a supply, generally inclines to assessing a diversity factor from an analysis of the connected load and use. This entails, among other things, sifting out the fact from the fiction in a description of his use by the user. Another and perhaps more reliable method of meeting this problem, providing figures are at the disposal of the engineer or the trouble is taken to obtain them, is to apply an average figure of demand per unit area. The table gives the average loading figures, as observed from personal experience, for a number of industries which, although by no means exhaustive, covers a fairly wide field. This method has the advantage that it can be applied without reference, except on a very general basis, to the user and can also be used as a check on an assessment from actual connected load figures.

Industry	Average Load Watts/sq ft of floor area	Average Load Factor per cent
Light engineering	3·5	23
Medium-heavy engineering ...	4·5	26
Accounting machines, typewriters, etc.	3·25	31
Clocks, instruments, electronic equipment	3·0	23
Clothes manufacture... ...	2·5	19
Cloth manufacture—spinning, weaving, etc.	6·25	17
Furniture manufacture ...	2·0	20
Special processes: Electrodeposition, heat treatment	2·0–11·0	15–60

The last item in the table relates to special processes where there is no reliable yardstick, e.g. plating, heat treatment, etc.; these can only be dealt with by individual consideration or availability of figures from a more or less exactly similar type of process. It is seen that the density of load can vary quite considerably.

It is sometimes the case that a user can give a more reliable estimate of his consumption in kWh, rather than in maximum demand. In such an instance, by applying a load factor, the demand can be fairly accurately assessed. Again, this depends on some average figure of load factor in various types of industry, and these are also given in the table. One has, however, to be a little more careful in using average figures in so far as load factor is concerned, because production times can vary quite considerably between factories doing the same type of work.

The determination of anticipated loading will allow the electricity authority to indicate whether the supply will be given at medium or extra high voltage. The tendency appears to be to connect more and more industrial consumers to the e.h.v. system. Sometimes the consumer is given a choice and also perhaps a choice between a m.d. two-part tariff and a block tariff. In either event it is important to have regard to the probable power factor of the installation which, in addition to influencing the rating of cables, transformers, etc., affects to a considerable degree the comparison of annual charges for electricity based on many industrial tariffs. A further point to observe is that where a guarantee condition applies it is desirable to obtain in the contract documents defining terms of supply, a reasonable development period in the application of the guarantee condition between supply first becoming available and subsequently reaching normal demands. It is suggested that a period of from six to twelve months is reasonable and should meet this contingency.

When contract documents are being prepared, the following of a mid-way line is, as in many other walks of life, found to be a happy compromise between over-elaboration on the one hand and, on the other, what is probably more serious, lack of sufficient information and detail in the specification and drawings. How frequently one finds during the course of a contract, that while special aspects of the work are not in accordance with the designer's conception, the contractor can show that what has been done complies with the specification and drawings.

The acrimony which can follow such incidents does not improve matters, besides bringing up the dreaded term "extras." To minimize this type of problem it has

* Scottish Industrial Estates, Ltd.

been found advantageous to include a description of the work giving, as it were, a word picture and forming a bridge between the specification and drawings. In addition, sufficient itemized detail on the drawings, and elevations where necessary, should be included so that where specific arrangement is necessary no ambiguity can arise. An added requirement in this connection is adequate liaison between drawing board and site.

When planning and preparing specifications it should be emphasized that detailed thought should be given to all aspects influencing installation and also subsequent utilization. Important aspects to be considered are practical suitability, capital cost and maintenance.

The selections should not be governed by capital cost exclusively. A simple illustration is recalled concerning a water storage tank installation where the normal float control system was installed. As is well known, systems of this type operate satisfactorily over the length and breadth of the country and probably no detailed thought was given to the selection. However, when the tank was constructed and the pumping sets were in operation it was found that the choice of control equipment left much to be desired, frequent maintenance coupled with difficulty of access resulting in a risk to maintenance men. The float switch control gear was ultimately and satisfactorily replaced by a fixed electrode installation.

Job Completion

The conditions governing the completion of a job should be incorporated in the contract documents in order to avoid controversial discussion at the final stage. When completing a job numerous sundry items often require attention as, for example, permanent clipping of cables, labelling switchgear, etc., and while these items do not seriously affect the usefulness of the installation they detract from the tidiness associated with a well executed installation. Often items which come into this general category include the passing over to the customer of any manufacturer's operating and maintenance instruction sheets, together with the preparation and handing over of "as fitted" record drawings as soon as possible after completion of the installation. It is important that this latter point is specified when preparing schedules and a brief summary and the details required should be included. In practice the condition is frequently met when the "as fitted" drawings are merely a bare reproduction of the contract drawings incorporating minor variations and do not give adequate information for record purposes; for example, dimensions relating to cable routes.

One other reason why it is highly desirable that record drawings should be available at the earliest possible moment is that frequently maintenance staffs are asked to accept responsibility for important installations without records being available apart from the knowledge acquired by the fortunate individual who "grew up" with the job.

One expedient which may be forced on the customer where the contractor, due to dilatory conduct, fails to have defects and omissions rectified in good time is to deduct the cost of making good these faults from retention money outstanding on the contract. Provision for this measure should be included in the general conditions of contract. It is, of course, important that details of these defects or omissions should be passed to the contractor early in the maintenance period.

As already indicated, due to the ever increasing demand for electricity, e.h.v. schemes of distribution are becoming more common and work associated with installation and maintenance is now being undertaken by staffs not normally used to dealing with e.h.v. work. Where the scheme of training of these staffs is inadequate it often results in serious operation difficulties, which, in subsequent financial cost far outweighs what may seem, when preparing the specification, an extravagant attention to detail. A frequent example in this category is that of jointing, where procedure possibly satisfactory for medium voltage work proves an expensive experiment on e.h.v. work. It is suggested that attention to detail and specifying is imperative and that manufacturers' instructions should be strictly carried out and/or evidence submitted that the jointer is qualified to carry out the particular grade of work being undertaken.

A further problem which invariably arises is the co-ordination of groups associated with an e.h.v. installation, particularly when it is brought into commission progressively. In this connection there could be, depending on the size of the job:—(*a*) customer's works group, (*b*) general electrical contractor, (*c*) switchgear manufacturer, (*d*) cable manufacturer, (*e*) transformer manufacturer, and possibly even (*f*) building contractor.

Groups (*c*), (*d*) and (*e*) may or may not be sub-contractors of group (*b*), the main electrical contractor. In the case where (*c*), (*d*) and (*e*) are not sub-contractors of (*b*) there is a greater necessity for some co-ordinating authority to be responsible for switching operations, etc. It is suggested that group (*a*), the customer's works group, can with advantage assume this responsibility as this particular group contains the people ultimately concerned with the operation of the installation. A useful method of tieing up responsibility in this connection is by use of a "permit-to-work" system.

It is of considerable advantage to have the contractual arrangements completed well in advance of the commencement of the electrical work in new construction. This should ensure that provision is made in the building structure for ease of installation of the electrical service and thus avoid additional and in many cases double work at a later date when the electrical installation is actually being carried out, e.g. ducts left in floors and walls for conduit runs, etc.

Coming within this category, an expedient which the writer has found extremely advantageous is the inclusion in the steelwork of the building of provision for the support of conduit runs for lighting and similar standard circuits. This ensures a uniform standard basic installation which although capable of extension to suit any particular process in some part of the building, can be readily restored to a fixed basis. In addition, it provides a ready made support for lighting fittings, many of the present day type of which are fairly heavy and when erected on a system of catenary wiring for support causes a considerable sagging if not actual damage at the conduit boxes.

Another point to be borne in mind at the start of the electrical work is a joint survey with the contractor or body responsible for doing the work, the purpose of which is to see if there is any amendment to the layout or procedure in the light of actual building which has taken place. For example, it may be found necessary to alter the position of some switchboards and other local switching, etc., and if the amended method is agreed at the outset it will avoid possible issues of a controversial nature arising, if not indeed extra work. It is also advisable to have a regular continuance of such joint meetings so that differences of opinion can be sorted out and mutual agreement reached. The foregoing results in the job being done in a harmonious atmosphere as against one of acrimony which inevitably causes delay and unnecessary waste of time and money.

The problem of conversion of factories is considerable in its scope, ranging from adaptation of large works built originally for war production and served by an extensive scheme of e.h.v. distribution down to the revision of

electrical installations necessitated by varying production requirements within one department of a factory.

Considering the former, seldom if ever will a system of distribution within a factory be suitable, without modification, for sub-division into small units. Assuming it is the policy for the local supply authority to ultimately accept responsibility up to the various consumers' premises, it is necessary at the outset to prepare and agree with the supply authority, a planned programme of work which may be complicated through the necessity of maintaining continuity of supply throughout the re-arrangement of the installation. No common procedure can be adopted in dealing with problems of this nature, as instances can be recalled where prior complete re-grouping of cables, switchgear, etc., was a condition of ultimate acceptance by the supply authority, while in other cases the authority accepted existing equipment as necessary and re-arranged to their own requirements. Expediency and economics govern to a greater or lesser degree the completeness in utility and frequently results in the finished work falling short of the standards that would be adopted for equivalent installations designed from scratch. In short, a case of "make do and mend."

The re-arrangement of the large war-time aircraft engine factory at Hillington, Glasgow, operated by Rolls-Royce, Ltd., was described in detail in the *Electrical Review* of 8th April, 1949. This scheme of revision catered for both e.h.v. and m.v. consumers. It is now proposed to consider briefly the division of a large works distribution scheme re-arranged for two consumers, each requiring a substantial e.h.v. supply. This is an example of one group continuing in production with a continuing electrical demand, the other with a progressive build-up of the load.

With operation as an individual works group, electricity supply was given at two main substations, these having on the consumers' side e.h.v. interconnector cables running between them which were looped into intermediate substations (Fig. 1). The main substation catered for heavy plant only, supplied at e.h.v., while the transformer and equipment for m.v. distribution were situated in the intermediate substations. For ease of reference, the main substations are referred to as "A" and "B" and the intermediate as "X" and "Y." The division of the factory was such that the new consumer could only conveniently be supplied from "X" and "Y," while the original consumer could only be supplied from "A" (Fig. 2). The first difficulty to be overcome was therefore one of supply, so that each consumer would finally have a direct contract with the supply authority.

A scheme was devised whereby through transplanting of switchgear, transformers, etc., between the various substations separate metering was achieved utilizing, with the exception of minor accessories, the existing equipment. The next problem was the execution of this very extensive re-arrangement so that supply was maintained where required. Fortunately the job could substantially be done in two stages, with one half of each of the main substation switchboards and respective interconnector made dead and still being able to provide supply to the majority of the factory premises from the other half. As the various groups were involved there arose the problem of responsibility in the matter of control of extensive supplies within

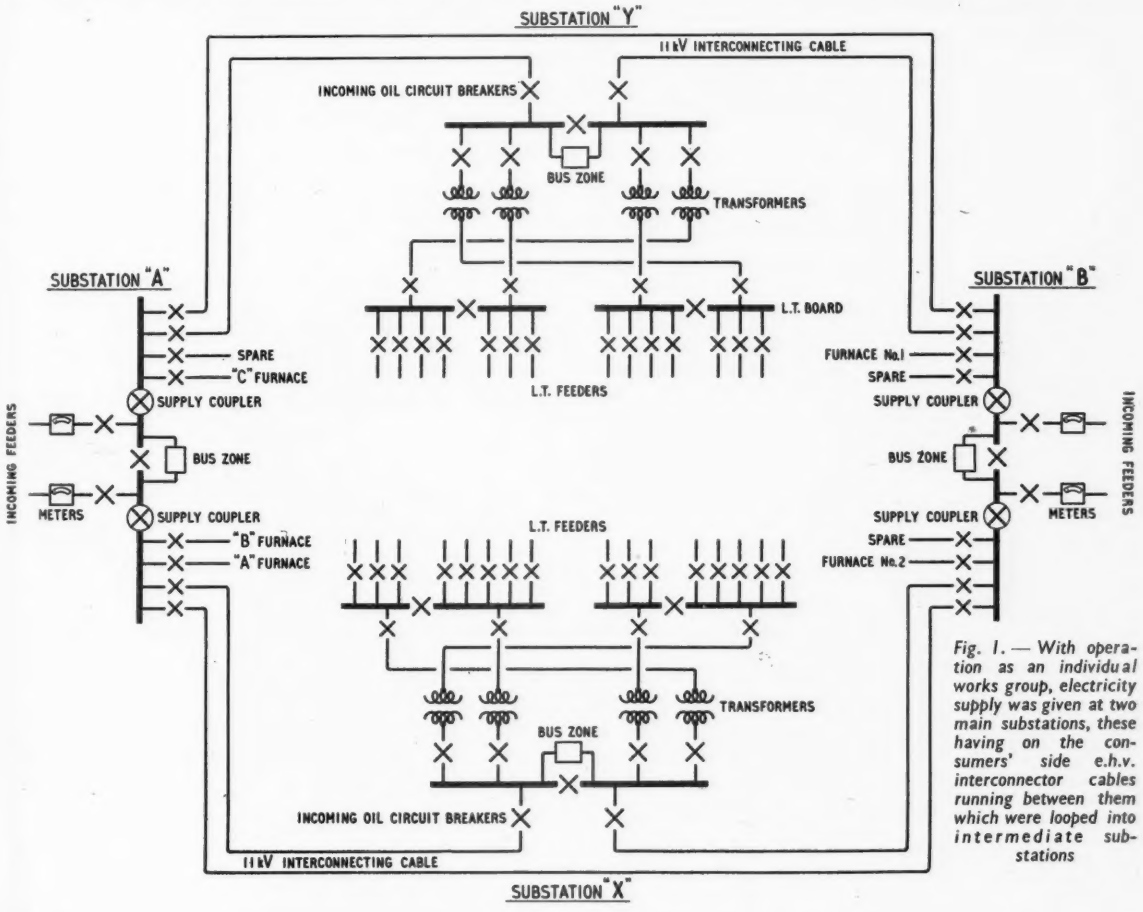


Fig. 1. — With operation as an individual works group, electricity supply was given at two main substations, these having on the consumers' side e.h.v. interconnector cables running between them which were looped into intermediate substations

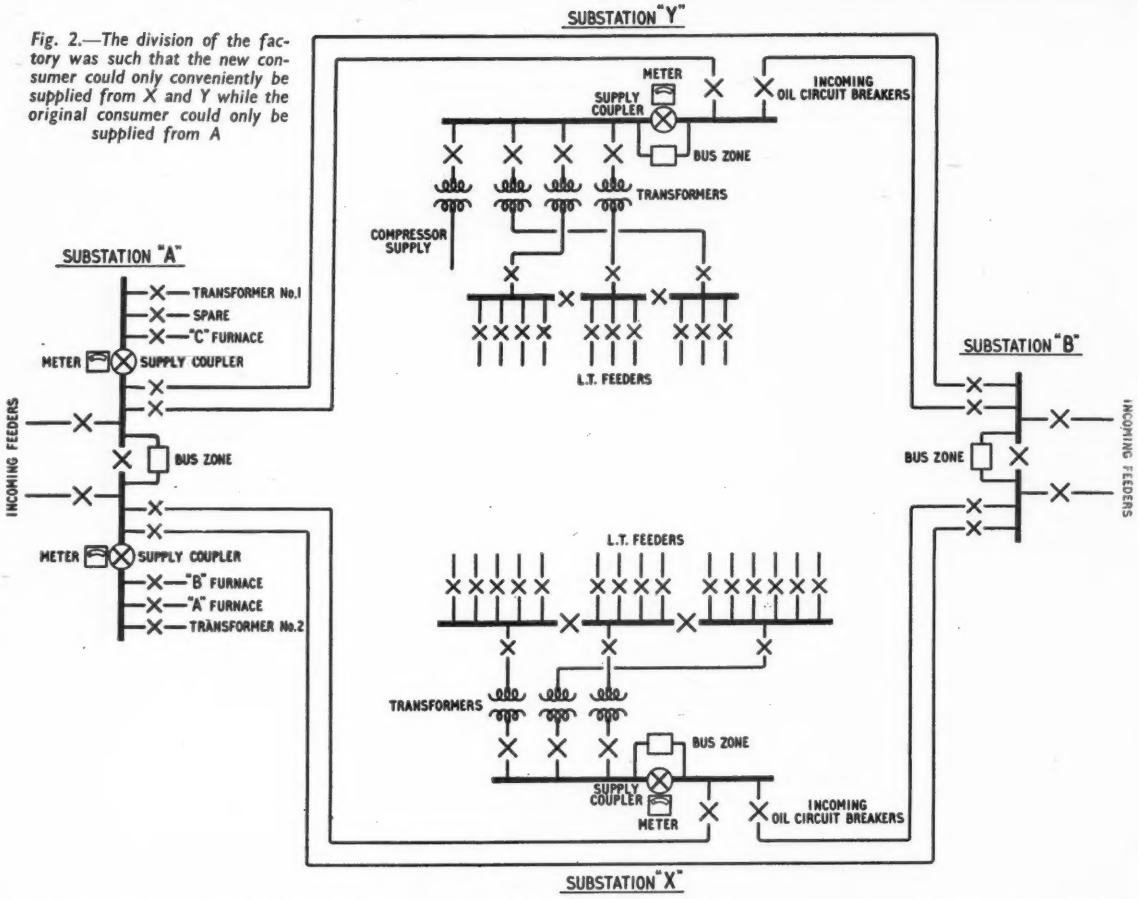


Fig. 2.—The division of the factory was such that the new consumer could only conveniently be supplied from X and Y while the original consumer could only be supplied from A

the factory and re-arrangement work, etc. An added difficulty was the fact that adaptation work in buildings and services was being simultaneously carried out in connection with the division of the factory.

The method found most successful was that the group mainly concerned at any particular period in the respective fields carried the responsibility for control, e.g. the original consumer took charge of the sub-metering and control of supplies not yet altered, the electrical contractor took charge on the re-arrangement side and as any supplies became necessary for other contractors, etc., he was responsible for control and allocation of consumption. The electrical contractor also tied up with the Electricity Board for the making dead of main supplies, etc. As the re-arrangements were progressively completed the new consumer took over certain responsibilities in stages. It will be noted that this allocation of responsibility is a departure from the recommendation made earlier in connection with the new e.h.v. installation, but it has to be borne in mind that in this instance there was more than one works group.

There were bound to be snags with so many different parties involved and as an example there may be cited the one encountered in connection with the overhead electric travelling cranes. Throughout the reconversion all the parties involved at one stage or another required the use of these cranes and the easy solution of immobilizing them and making trolley wires dead until completion of the work could not, with any practicality, be done. The main difficulty arose with the number and various groups of tradesmen who required to work at or above truss level in roof work, re-arrangement of services, etc. The best that could be done in this connection was that the electrical contractor was responsible for the keys of the switches controlling the trolley wires and anyone desiring the use of the cranes had to apply to him, when it was ensured that the bay was reasonably clear of workmen, while the trolley wires were alive. Similarly, any tradesmen, such as painters, using the cranes had to apply to the electrical contractor to have them moved.

The whole of the work was co-ordinated by a competent electrical clerk of works who was resident on the site. The final arrangement of the high voltage network was such that the Electricity Board required to take over the responsibility for the control of switchgear and cabling, etc., which had hitherto belonged to the original consumer.

In conclusion it will be apparent that the treatment of the subject has been such as to deal with generalities rather than any specific technical points, and such being the case it is perhaps difficult to draw irrefutable conclusions. However, it is strongly felt that, apart from technical aspects, the vast majority of the problems and difficulties encountered in practice invariably develop initially from omissions or errors at the planning stage. It is at this juncture that emphasis should be laid on the necessity for close and detailed study of all aspects influencing the finished work.

Finally, I wish to acknowledge the help given by Mr. R. Clark, A.M.I.E.E., electrical engineer to Scottish Industrial Estates, Ltd., for his co-operation in the preparation of this article.

ADHESIVES

Their Use in the Electrical Industry

By A. E. WILLIAMS, Ph.D., F.C.S.

THE adhesives which may be regarded as belonging particularly to the electrical industry are those that are used in insulation, for sealing and filling, magnetic cores, etc. In this sphere the use of ethoxyline resins has developed rapidly during the past few years. These materials possess good dielectric strength, high resistance to moisture, are mechanically strong and are resistant to many chemicals. They possess exceptional adhesion to metal, ceramics and other non-metallic materials, and were originally developed as an adhesive for light alloys to take the place of spot welding and other methods of joining metals. The resins combine in a high degree the properties of hardness and flexibility, neither characteristic being achieved at the expense of the other. Ethoxyline resins were first developed by Ciba, Ltd., in Switzerland and are now in full-scale production at the Duxford factory of Aero Research, Ltd., being marketed under the trade name "Araldite," which appears in several different forms to suit particular purposes.

Dielectric Strength

Electrical tests on slabs of ¼in thickness prepared from one of these resins in powder form, show that it has an s.i.c. of 4·1, a power factor at room temperature of 0·004, and a breakdown strength of about 300 V/mil. Moreover, these properties are not significantly changed after exposure to two of the conventional tropical cycles. At 90 deg C the power factor rises to 3·5 per cent, the s.i.c. to 4·9 and the breakdown strength falls to 260 V/mil. These figures indicate that the resin is a good electrical insulator,

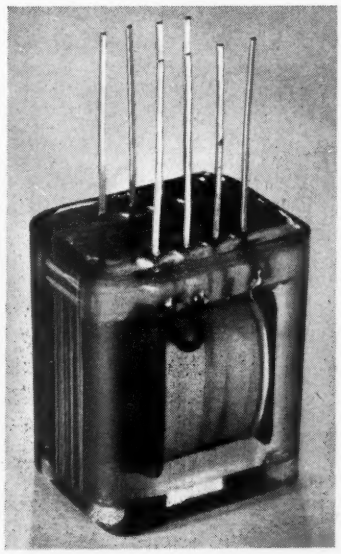


Fig. 1.—Transformer potted in "Araldite" D (Evershed & Vignoles, Ltd.)

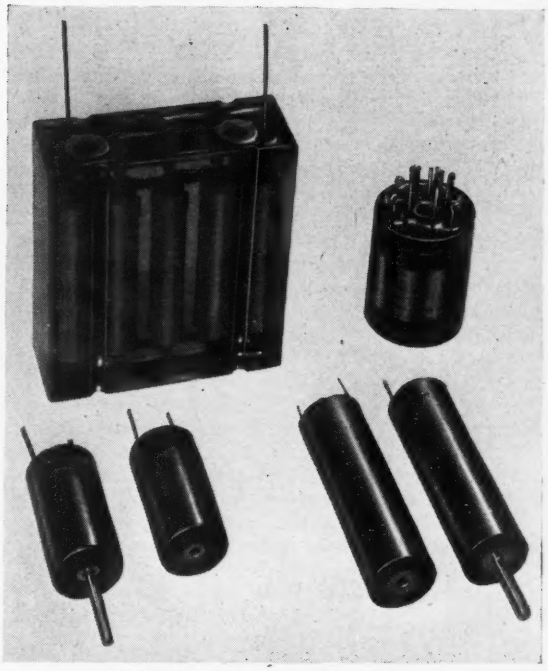


Fig. 2.—Transformer, valve assembly and resistances, fabricated with the aid of "Araldite" (Evershed & Vignoles)

particularly resistant to moisture and suffering no serious loss of electrical properties at temperatures up to 90 deg C. When the resin is used in conjunction with zircon sand as a filler, in the proportion of 1 to 3, the s.i.c. rises to a value of 6·7 at 20 deg C and the power factor to 0·017, while the electric strength falls to 240 V/mil. The use of a filler such as sand has the advantage of strengthening the insulator mechanically, and particularly in respect of abrasion resistance, while largely preserving the electrical qualities. It also has the advantage of appreciably cheapening the material.

The resin is available in the form of a casting resin, which may also be used in combination with fillers to give dielectric products of good quality. Materials of this class, and other solventless resins, are being employed as a means of insulating dry-type instrument transformers, including both current transformers, where the mechanical strength of the insulation is important, and voltage transformers rated at up to 60 kV where the electrical strength is important. To employ filled resins in such circumstances is particularly advantageous as it leads to a simplification of the manufacturing process. The conventional means of insulating such transformers is based on a somewhat laborious hand-taping, with materials which are by no means cheap. The use of casting resins goes far to reduce the labour required for the process of insulation, while it gives a product whose performance is in no respect inferior to that of the type of transformer which is insulated by taping. The adoption of this means of insulation may well impose certain limits on design in respect of methods of construction and no doubt the full significance of such limitations will be seen only when the range of applications has been more fully explored. In Fig. 1 is seen an example of a transformer potted in the resin, while Fig. 2 depicts resistor units and a selection of wire wound resistances with studs and inserts potted in the resin.

An application of sand-filled resins is the preparation of guide bars for use with the belt of the four-million volt

Van der Graaf generator which has been constructed at the A.E.I. Research Laboratory at Aldermaston. The guide bars, which are about 18in long and $\frac{3}{4}$in in diameter, were required to be smooth, to be resistant to the abrasion of the belt passing over them, and to have high dielectric strength having regard to the d.c. stress to which they would be subjected. As a core for the guide bars, a steel tube was used of $\frac{5}{8}$in diameter, and this, in relation to the finished outside diameter of $\frac{7}{8}$in, imposed an upper limit on the "curing" temperature of the resin, because of thermal contraction on cooling from the curing temperature. It was found that the cure should not be performed at a temperature higher than 150 deg C, and in order to avoid a lengthy cure at this temperature, the insulation on the guide bars was made from "Araldite" mixed in the proportion of 1 part to 3 parts of zircon sand. The resulting d.c. breakdown strength was 57 kV.

An indication of the abrasion resistance of the sand-resin mixture is given by tests which were performed on a slab of the material by loading on to it a rotating steel wheel and measuring the length of the groove worn in the material by the wheel during a given number of revolutions at a given speed. Whereas the length of groove worn in a common glass was 6 mm under a given set of conditions, the length of groove worn in the sand-filled resin under the same conditions was only 2·5 mm. The electrical performance of the guide bars is satisfactory and the frictional wear on them is very slight.

Mica Components

Since some of the ethoxyline resins are available in powder form, they are used as an alternative to the shellac type dry bond generally used in making commutator-segment micanite. The resin-bonded micanite has been prepared by pressing for $1\frac{1}{2}$ hours at a temperature of 165 deg C and a pressure of 800 lb/sq in. The material has good electrical characteristics and mechanically it is hard by virtue of the thermo-setting property of the resin. Such micanite is much less affected by moisture than the conventional shellac-bonded micanite. In Fig. 3 are seen specimens of silvered mica condensers moulded in "Araldite" casting resin. The London company making these manufacture condensers to approved specifications for use in all Service equipment. In several specifications the most exacting requirements are stipulated, including operation at the specified working voltage over a range of temperatures from —40 deg C to 100 deg C and complete moisture resistance throughout this range is, of course, essential.

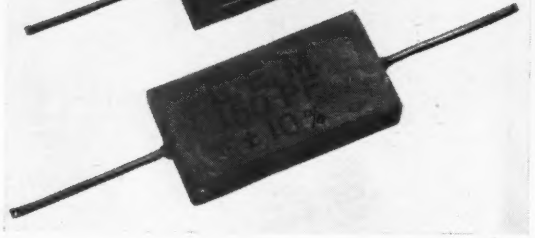
Porcelain Assemblies

In respect of mechanical strength, and thermal and chemical stability, joints in porcelain using the ethoxyline resins as the adhesive are quite satisfactory. In this connection it is interesting to note that the strength in tension of the resin joint between two porcelains is usually such that when the joint is pulled the porcelain fractures rather than the joint. This has been demonstrated by a range of test specimens in the form of 1in diameter rods of porcelain jointed at the centre in a plane normal to the axis. The specimens were tested to destruction in a tensile machine with self-aligning jaws, and the joint itself was not fractured. When fracture occurred near the joint it was found that the break had taken place just within the porcelain adjacent to the joint, but in some cases the porcelain had broken well away from the joint. The mean value of the breaking load was 1 ton. Further tests on other samples show that they are not seriously affected by exposure to open steam, while tropical tests indicate that no loss of joint strength is to be expected as a result of prolonged exposure to high humidity.

Such joints are easily made, since no applied pressure is required. A further simplification of the technique of jointing has been made by using external heating arrangements so as to avoid the need for an oven to cure the resin, the heat being applied to the joint by means of a sheathed heating element in the form of a coil.

The adhesive jointing of ceramics is, of course, not confined to non-metallic bonds, for there are many electrical designs which include ceramic and metal assemblies. It is common practice in switchgear to make lifting rods and mechanical links in synthetic resin-bonded paper, or resin impregnated and bonded wood laminates. In such cases ferrules and end-caps may be screwed or cemented

Left: Fig. 3.—Silvered mica condensers moulded in "Araldite" B (London Electrical Manufacturing Co., Ltd.). Right: Fig. 4.—Adhesive bonding of porcelain assemblies with "Araldite." Result of tensile testing: porcelain breaks but bond of porcelain to metal remains intact (Aero Research, Ltd.)



to the rods, and they are generally also pinned as a safety measure. It has been shown that compared with previous practice, ferrules bonded with the ethoxyline resin or to resin-bonded paper rods are so much more secure that, were it not for fear of failure of the human element, the use of pins could be dispensed with. Where a metal component is surrounded by porcelain, the two being bonded together with ethoxyline resin, when the component is subjected to a tensile test, the porcelain will always break before the resin bond; a typical result is illustrated in Fig. 4.

In pure tension, joints made with the resin have a failing load of about 5,000 lb/sq in and in pure shear, uniformly distributed over a bonded area, this is increased to about 10,000 lb/sq in, though in practice it is very rare for such loading to occur. The advantages of resin adhesives are such that their uses are likely to be greatly extended when prejudice against such bonding techniques is completely overcome.

Laminates of paper, fabric and wood are much used in the electrical industry, and it is sometimes necessary to bond together components made from these laminates. In the past the adhesive used has been either shellac or an older type of synthetic resin; in the latter case the bond requires thermal curing, while in both cases the strength of the bond is not very great. It is possible to bond laminates successfully by means of the ethoxyline resins, and this, of course, under contact pressure only. However, to cure this type of resin in a short time requires a temperature which is generally too high for the laminates. This problem is overcome by using an allied adhesive consisting of a polyvinyl formal powder and a phenol-formaldehyde liquid resin, which under heat dissolves the powder and gives it sufficient local mobility to wet the surface of the laminates. By this method joints can be made in a matter of 10 min at temperatures as low as 120 deg C. Such joints have to be made under pressure, but having regard to the resultant strength and the shortness of the cure, it is a useful means of making strong bonded assemblies of laminates in a manner not previously known.

Higher Technological Education

Government's Plans for Expansion

LAST week Lord Salisbury in the House of Lords and Mr. Maudling, Economic Secretary to the Treasury, in the House of Commons, presented a statement announcing the Government's plans for the education of technologists urgently required by industry.

The statement emphasized the fact that to meet foreign competition we must improve our own skill through technological education, and a tribute was paid to the valuable and far-sighted advice of the University Grants Committee and its Technological Sub-Committee.

Plans provided for the massive expansion of the Imperial College, South Kensington, and for major developments at Glasgow, Manchester, Leeds and Birmingham. They included developments on a fairly large scale at Cambridge and Sheffield, specialized developments at Cambridge and Sheffield, and at other centres, including Wales. Some would be financed by industry and some by Treasury grant. The more notable were at Edinburgh, Newcastle, Southampton, Nottingham and Swansea.

An endeavour would be made to steer an effective middle course between excessive centralization and an undue dispersal of resources, and attention was being concentrated on institutions which were already receiving Treasury grants. Higher technological education must be closely linked with other university studies so that those who were studying technology would work closely with those who were occupied with the more fundamental problems of science and with its application in other fields.

It was increasingly realized—in America and on the Continent as well as here—that the men who were to hold positions of the highest responsibility in industry needed a broader education than could be given in institutions devoted entirely to technology, or even to science. The problems of industry were problems of human relations, as well as of science, and in training for industry the humanities had an important part to play. Where there was a technological institution and a university at the same place and in association together—as in London, Glasgow and Manchester—this linking of studies could be achieved. But if new universities were to be established in other centres by "upgrading" technical colleges, it would be necessary to provide them also in addition with departments of pure science and arts—a burden in terms of teachers, buildings and money which we could not afford.

The best progress would be made by building on what already existed and by linking technological development as closely as possible with existing university institutions rather than by starting entirely new technological institutions. Close association between the universities and industry in this field would be sought. It was encouraging to hear of the founding of new chairs in technological subjects with funds raised from industry in the Universities of Durham, Edinburgh, Nottingham and Wales; in many other forms industry also gave valuable financial support. The universities were becoming more quickly responsive to industrial needs, for example, by designing post-graduate courses to meet particular local industrial requirements and by asking industry to help with instruction.

Recurrent Grants

About one-eighth of the total recurrent grants to the universities was used for technology—in a narrow sense of the term—i.e., about £3 million a year. The Government was now making additional recurrent grants for technology of £196,000 for the academic year which had just begun, £404,000 for the next year, and £704,000 for the academic year 1956–57. In the next two years, there would thus be a growth of recurrent expenditure of something like 25 per cent, in special extra grants alone, in addition to the extra cost of salaries which had previously been announced.

For building and equipment, the capital expenditure and liabilities against public funds which had already been incurred in recent years—again on a very narrow definition of technology, excluding all pure science—amounted to about £10 million, including the work now in progress at Imperial College, at the Royal Technical College, Glasgow, and the Manchester College of Technology. There was a further authorization for buildings of £1 million, in addition to the normal university building programme to be started in the financial year 1955–56.

The total capital cost of the Imperial College project over a period of ten years or more might well be of the order of £15 million. The universities were getting ahead very fast with the expansion of higher technological education, and the figures showed that very substantial resources were being devoted to this work. It was an investment which could not yield quick results, but its existence was one of the best reasons for confidence in our industrial future.

SMITHFIELD SHOW

Prominence of Electric Grain Drying Equipment

IT is of course largely due to the increased mechanization in all forms of farming that this country's range of agricultural products has been able to be expanded to such advantage and that the total output has been increased by 50 per cent over that of 1938. The important part played by electricity in this achievement was very apparent last week at the annual Smithfield and Agricultural Machinery Show at Earls Court, London, where a very large proportion of the 380 stands displaying trade exhibits included electrical aids to production.

Particular attention was paid this year to grain drying and almost the whole of the British Electrical Development Association's exhibit was devoted to demonstrating the advantages of using electricity for the drying, storing and conveying of grain and grass crops. In-silo grain drying and storage, in-sack platform grain drying and barn hay drying were all represented and of special interest was a new multi-purpose unit suitable for dealing with both hay and grain.

New Multi-Purpose Unit

Developed by the British Electrical and Allied Industries Research Association, the prototype of this new appliance was illustrated by means of enlarged photographs together with operational data. The dryer is basically a platform in-sack grain dryer, adapted to drying wilted grass, thus extending the use of the installation over a longer period of the year. During experiments carried out this season on a 320 acre farm in Hampshire, grain was dried at a cost for electricity of 11s per ton for an average removal of 6 per cent of moisture. The average cost of electricity for drying part wilted grass has worked out at £2 8s 10d per ton. The bulk of the dried grass showed a crude protein analysis of 16 to 19½ per cent, although the plant was not ready for operation until 1st July.

Also seen in operation was part of a 20-hole in-sack grain dryer, while a reproduction of part of a typical barn hay dryer installation illustrated the technique of cold air hay drying in the barn—samples being displayed of the actual product obtained by this method. Examples of electrical equipment for in-silo grain drying were on show, together with the E.D.A. scale model of a complete drying plant, and also samples of ventilating floor materials for in-silo installations. Demonstrations were given of the use of electrically operated instruments for the measurement of the moisture content of grain. A section of the stand was utilized to display fittings specially designed for lighting farm buildings and yards. The actual equipment was supported by a number of pictorial displays of typical farm installations.

A multi-purpose crop dryer of the type referred to above was actually to be seen on the stand of the General Electric Co., Ltd., who were exhibiting for the first time. This plant employs a duct air heater and a single stage axial fan made by Woods of Colchester, Ltd. A self-contained panel controls the heater and houses the starting gear for the fan and the main switch fuses. Other platform and silo grain dryers of various capacities were also on view together with such other items as a "Genalex" pressure type food cooker suitable for cooking and sterilizing potatoes and similar foods, a 20 gal dairy water heater designed primarily for small and medium sized farm dairies and small ice-cream establishments, a water storage steam raiser providing steam for sterilizing recorder milking plant, as well as supplying hot water by steam injection, and a full range of infra-red heaters of both bright and dull emitter type for pigs, poultry and other livestock.

What is claimed to be the cheapest grain dryer on the market was shown by Gordon Felber & Co., Ltd. This 20-hole platform in-sack unit, which is known as the "Atlas Ideal" costs only £95, complete with four removable hole covers and a 15 kW three-phase fan heater. Other models with either three- or single-phase fan heaters are available with platforms accommodating up to 60 sacks. Other new apparatus concerned with the handling and treatment of grain included the Automobile Palace "Diana" grain blower and grain pre-cleaner and the Scottish Mechanical Light Industries grain blowers and "Popular" hammer mills with built-in motors. All types of grain conveying plant as well as other examples of a range of mechanical handling equipment for every industry were features of Geo. W. King's display. A recently introduced product of Atkinson's Agricultural Appliances, Ltd., is the "Silo-Aid" suitable for cutting silage, peat and stock-yard manure: it weighs 47 lb and its ⅓ h.p. motor is protected against overloading by a simple trip device which can be quickly reset from the operating position.

Pumping Plant

In view of the recent disastrous floods which have hit many small farmers, particularly in the North and West, much attention was taken in measures for combating the damage. Arthur Lyon & Co. (Engineers), Ltd., who are specially prepared to deal with urgent inquiries, showed a full range of "Alcon" self-priming centrifugal agricultural pumps, which are either portable or transportable and have outputs ranging from 3,000 to 30,000 gal/hr. This company also demonstrated examples of "Alco" generators for the country dweller, including a diesel set producing 1,250 W, 230 V a.c. for providing normal domestic lighting, power, radio and television requirements; a 5 kW diesel alternator set; a 500 W a.c. set; and a battery charging set. Provision can be made for fully automatic operation if required.

Generating sets of 1 kW and 2 kW capacity and pumps were shown by the Wolseley Sheep Shearing Co., Ltd. A 600 W portable generating set is a recent addition to the range of Tarpen Engineering Co.'s products which include various devices for cutting grass, trimming hedges, etc. Among prime movers suitable for coupling to generators is the new Armstrong Siddeley 6 h.p. single cylinder air cooled diesel engine. With a representative selection of diesel fuel injection equipment C.A.V., Ltd., showed starters, dynamos, control boards, lamps, batteries, etc., for agricultural tractors and for portable and stationary engines.

Electric power equipment, lamps and lighting fittings specially suitable for use on farms and in dairies made up the exhibit of the British Thomson-Houston Co., Ltd. The "Stavolt" close voltage regulation alternator for small engine-driven generating plants, shown supplying some of the working exhibits on the stands, has such an inherently close voltage regulation characteristic that no automatic voltage regulator is required. The alternator

can be used as a starter motor operating from a battery and provision is made for recharging the battery from a pair of d.c. terminals on the alternator. Some of the working exhibits on the stand were supplied from this alternator. Motors representing every type of enclosure and mounting were seen in operation, and with them was a selection of typical control gear such as direct-on-line contactor starters, push-button starters, float-operated switches, etc., as well as a number of industrial electric heating elements.

In a display of manufacturers' plant and machinery fitted with B.T.H. electrical equipment was a Penny & Porter grain dryer, an Alfa Laval portable milking machine, a Gascoigne "Roto-freeze" milk cooler, a Wolseley sheep-shearer, a typical pump unit, a Martin potato steamer and a Wolseley bucket heater.

Various new items of air compressor plant introduced by B.E.N. Patents, Ltd., included a portable general purpose unit, a portable compressor and a calf inflation unit for abattoirs. With compressors on the Laycock Engineering stand were small portable arcless welding and brazing sets. Among new Black & Decker tools were a 9in heavy duty saw, a 5in saw attachment to convert a ¼in drill or sander into a power saw, and a saw table attachment to fit on a lathe. The Plessey Co., Ltd., showed a new range of small, lightweight multi-way connectors for television, field telephones, etc.

Refrigeration equipment was well represented. A full range of "Prestcold" refrigeration equipment for the wholesale and retail meat trader, allied trades and farmers included coldrooms in alternative finishes and designs, open and closed refrigerated display counters with and without refrigerated storage facilities, display units for existing counters, "Prestofreeze" home freezers, low temperature frozen food conservator cabinets, a new range of unit coolers for coldrooms, a heavy-duty refrigeration unit for abattoirs and large meat stores, and a complete range of domestic refrigerators.

In a comprehensive display of Frigidaire chill rooms, freezers, service cabinets and window display fixtures special attention was drawn to the company's automatic defrosting system. A new Hussmann refrigerated open display cabinet is suitable for either counter or window, and a British Automatic Refrigerators unit converts a window slab into a refrigerated display. The Smithfield Refrigerator Co., Ltd., made a special feature of its "Rotorflow" refrigerated "Stallboard" and open display counters. The new Purlac milk cooler, apart from cooling milk, can also be used for cold storing meat, poultry, fish, butter, etc.

Among the latest improvements incorporated in a mobile butcher's shop shown by Smith's Delivery Vehicles, Ltd., are a hygienic non-slip aluminium tread plate floor, and complete washing facilities, including a hot water wash-basin and tank.

Poultry and Egg Production

IN the short time since the removal of the remaining wartime controls on feedingstuffs, etc., remarkable progress has been made by the poultry-keeping industry in this country. Although imports are below pre-war levels and the demand is greater, supplies of both eggs and table poultry are now plentiful. It is estimated that British poultry-keepers are producing over 500,000 tons of eggs and 100,000 tons of poultry meat annually, with a combined value of more than £150 million. It was not surprising, therefore, that last week's National Poultry Show at Olympia—the ninth of its kind to be organized by the *Poultry World* and *Farmer and Stock-Breeder*—attracted a record entry.

From the electrical point of view modern poultry-keeping provides a worthwhile load, and an effective display illustrating the many and varied ways in which electricity is used in the industry was staged by the British Electrical Development Association. These range from incubators, infra-red lamps, appliances for deep-litter rearing and

A view of the Electrical Development Association's stand at the Poultry Show, Olympia, and (right) visitors to the Show watching one of the cookery demonstrations given by Marguerite Patten, the television cookery expert, at the E.D.A. kitchen

" cafeteria " battery cages to egg washers, candlers, poultry pluckers and equipment for deep-freezing and storage. A separate " Chicken in the Kitchen " stand contained a wide range of modern electric cookers and other appliances, and here regular demonstrations of new and unusual ways of preparing meals incorporating eggs and poultry were given by Miss Marguerite Patten, the B.B.C. television cookery expert.

Improved labour-saving appliances on view on manufacturers' stands included the " Jamesway Magic-Flow " automatic feeder (Neata Products) in which an electric motor imparts a shaking action to a series of troughs fed from a hopper so that the food is evenly spread throughout. Modifications to brooders included a new infra-red lamp with guard by L. A. Wren & Co., while among incubators a new introduction was the Stephens preheated 24,000 egg cabinet type with automatic turning gear. For poultry preparation Comb Pluckers, Ltd., showed a " Pluckett " model ($\frac{1}{2}$ h.p. motor) for the small producer, capable of defeathering birds at the rate of 15–20 an hour against the 60 birds per hour with the " Rapid " (1 h.p. motor). Cope & Cope exhibited a sinew extractor and a flight and tail feather plucking machine, a prototype double sided model of the latter being also on view. Egg washers included a new junior model (Curfew Appliances, Ltd.), and A.E.S. (Easingwold) exhibited an improved motor-operated hatching tray washer.

Demonstrations were given during the Show of egg grading and packing and the preparation of poultry for marketing.

Railway Electrification in Brazil

From Our Rio de Janeiro Correspondent

RISING operational costs and the urgent need to increase train lengths and speeds are impelling Brazil to resort more and more to railway electrification. Where this is not immediately possible, diesel electric traction is rapidly replacing steam. Largely as a result of increased wages, 15 federal railways in the country had a total accumulated deficiency of £54 million in 1953, while the inadequate railway facilities seriously delayed the distribution of foodstuffs, industrial raw materials and manufactured goods.

The first government-controlled railway to be electrified was the Oeste de Minas (now Rede Mineira de Viaçao). In 1929 the 73 km of track between Barra Mansa and Augusto Pestana was converted, the system adopted being d.c. at 1,500 V. In 1936 electrification was extended from Augusto Pestana to Minduri (108 km) but the third stage, from Barra Mansa to the Atlantic port of Angra dos Reis, was deferred owing to lack of funds and wartime difficulties and could only be undertaken in 1953.

Meanwhile, in 1948, the State Government proceeded with the fourth stage of its electrification programme and converted the section between Belo Horizonte, capital of Minas Geraes, and Divinopolis at 3,000 V d.c. Although the cost was three times that of the earlier work, the project has been amply justified, resulting in an annual saving of £100,000 in operational costs, increased efficiency and greater carrying capacity. The total electrified length of the Rede Mineira's lines, excluding the incomplete section to Angra dos Reis, now amounts to 333 km. The entire system is being standardized at 3,000 V and further extensions are planned.

The Central Brazil, the most important of the national railways, began electrifying its suburban lines at Rio de Janeiro in 1935 on the 3,000 V d.c. system, with overhead current collection. The necessity for electrification was made evident by an increase in the number of suburban passengers from 12 million in 1900 to 63 million in 1934 and 84·5 million in 1953. The electrified section now extends from the Rio terminal station in a radius of 108 km and has a total length of 481 km. The Central Brazil is now electrifying the 34 km section between Barra do Pirai and Volta Redonda, on the Belo Horizonte main line. At the same time the line from Belo Horizonte to Lafaiete is being equipped with diesel-electric locomotives.

In Sao Paulo, which has 71 per cent of Brazil's electrified lines, the Santos-Jundiai (ex-British Sao Paulo Railway) had been electrified between Jundiai and the Maua station, over 87 km of double line, by the end of 1953. The 65 miles between Sao Paulo and Campinas is now covered in 82 minutes, with two 2-minute stops at intermediate stations. The trains are three-car sets, seating 108. Four 200 h.p. motors, nose suspension type, give a speed of 65 m.p.h. Electrification has reduced fuel costs on this railway by over 50 per cent and, together with other improvements, has enabled staff to be reduced by 25 per cent.

The Paulista Railway was the pioneer of railway electrification in Brazil, having started to convert its main line in 1920. Over 490 km of the two main lines, running north and westwards from Jundiai, are now electrified.

The Sorocabana, another important railway in the State of Sao Paulo, began electrifying its system in 1944, when the Sao Paulo–Sorocaba section was converted. To-day it has 470 km of electrified lines between the capital and Bernardino de Campos. Electrification will be extended to Ourinhos this year and later to Assis, while a 25,000 kW hydro-electric station is being built at Capivari to permit electrification of the section from Sao Paulo to Santos.

So far, railway electrification in Brazil has been confined to the States of Sao Paulo, Minas Geraes, Rio de Janeiro and the Federal District. Including several small units and mountain railways, some 1,324 km of line had been electrified by the end of 1952. From then onwards plans were adopted to extend electrification to other States. The Parana-Santa Catarina Railway is converting the difficult mountain section between the port of Paranagua and Curityba, and the Leste Brasileira is electrifying 250 km in Bahia. It will obtain its power supply from a 20,000 kW thermal station now being built at Aratu, which will receive natural gas from the Reconcavo oilfields.

Audio Frequency Measurement

" NOTES on Applied Science No. 8," produced by the National Physical Laboratory and published recently by the Department of Scientific and Industrial Research (price 1s net) deals with power measurements by means of electrostatic, thermal and electrodynamic wattmeters, over the range 25 c/s to 30,000 c/s, i.e., approximately the audio frequency range. The electrostatic instrument is delicate and has a slow response, but is singularly free from frequency or power factor errors. It has been calculated that there is no significant error in the instrument itself at any frequency less than 1 Mc/s. In practice there are errors in the auxiliary resistors which, at present, limit the maximum frequency for accurate measurements to about 30,000 c/s.

The accuracy of the thermal wattmeter is dependent on the law of response of the thermo-junctions used and is very much less than that of the electrostatic instrument. It is, however, inexpensive, and its errors are not usually dependent on frequencies up to about 30,000 c/s, at which the quality of the auxiliary resistors may impose a limit. The electrodynamic wattmeter is robust and has a quick response. It is the most suitable of the three types for general measurements. There is, however, considerable difficulty in maintaining accuracy at the higher frequencies. If, however, feedback amplifiers are used to supply the wattmeter coils it is possible to construct an instrument with the same upper frequency limit (30,000 c/s) as the electrostatic and thermal types.

New 60-ton Arc Furnace

Securing a More Even Balance Between Open-Hearth and Electric Steel Furnaces

The furnace during tapping operations

THE commissioning by Samuel Fox & Co., Ltd., at their Stocksbridge works last week of a 60-ton arc furnace for the melting of alloy and special steels was a significant metallurgical development. The equipment is believed to be the largest electric arc furnace in Western Europe. This particular significance is attached to the furnace by reason of its size relative to the types of steel it is designed to melt.

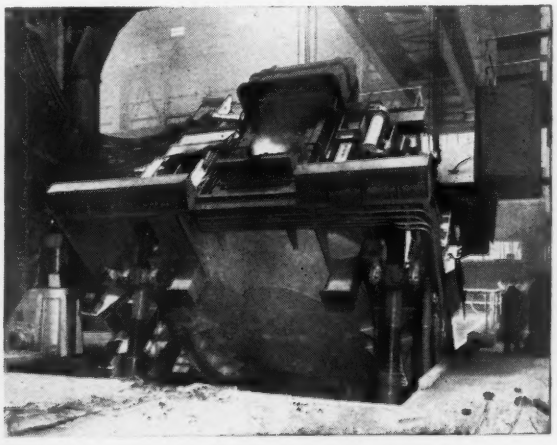
In the interests of efficient and unimpeded manufacturing operations, and with an eye to possible future developments, it was decided to house the furnace in a new melting shop constructed on open ground at the west end of the works, and at the same time to reconstitute and extend the adjoining raw material yards so as to serve both the new and the existing shops.

The furnace was built by Birlec, Ltd., under licence from the Pittsburgh Lectromelt Furnace Corporation. It is a top charged, direct arc tilting furnace with three automatically adjusted vertical carbon electrodes, each of 20in diameter, in sections 6ft long, connected to the 15,000 kVA power transformer. The furnace shell is 19ft in inside diameter, backed with an 18in thick refractory lining, the bottom refractory thickness being 27in and the roof, which is suspended at four points, 14in thick.

Charging is carried out by lifting the roof and swinging it clear towards the launder on a robust ram, the movement being effected hydraulically. The charging bucket is thereby given complete access to the furnace. Tilting of the furnace to a maximum of 45 deg forward and 15 deg backward is also operated by the oil hydraulic system. This system comprises three 30 h.p. motors and pumps situated in the basement, with remotely controlled push button starting and electro-hydraulic operating valves.

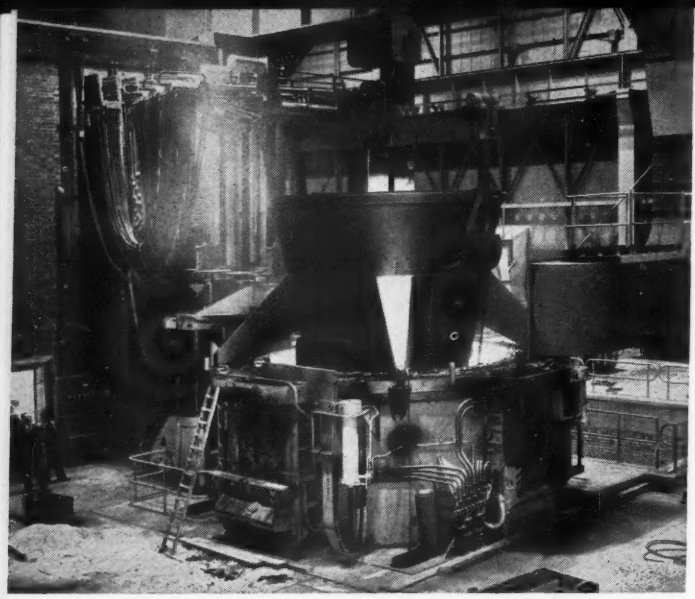
The B.T.H. electrode control system consists of one amplidyne regulator per phase coupled through a power generator to the electrode winch motor. Provision has been made for four amplidyne motor generator sets, any three of which can be selected. A special feature of this control is that a permanent torque is applied to the winch motor to counterbalance the weight of the electrode masts. Electrode clamps are made from high conductivity water-cooled copper castings, the slipping and tightening of the electrodes in these clamps being achieved by means of a pneumatically operated opening and spring closing mechanism. Water cooling is applied to the slagging and side doors, together with their arches and jambs, and also to the top of the furnace shell which incorporates a continuous bezel ring of box section to act as a stiffener and also to locate the roof ring.

Instrumentation is adequately provided to facilitate



The furnace tilted at the completion of its pour

Left: Making additions to the melt through the slagging door by a machine charger



Charging the furnace from the crane suspended basket

furnace operation and control, indicating and recording equipment being provided for the incoming electricity supply, power supply to the furnace, consumption per heat, electrode voltages, and for the fault alarm system. Similar facilities are provided for roof and hearth temperature control in addition to equipment for the indication of flow and temperature of the many water supply circuits. The temperature of the molten metal is measured by means of a Schofield type platinum/platinum-rhodium thermocouple. A flexible cable connects the couple to a large illuminated 20in diameter dial indicator, and a record in ink is made automatically at the same time on a chart recorder in the control cabin. Safety of plant operation is well provided for, including electrical and mechanical interlocking where advisable, for example, to prevent tilting of the furnace unless the roof is closed down on the shell.

At the time of ordering the furnace consideration was given to the question of stirring the bath by electromagnetic methods, and the plant layout was arranged so that this could be carried out if it were ultimately thought desirable. Subsequent investigation led the company to the belief that a stirrer could both improve the efficiency of the steelmaking process and lighten the physical work involved, for which reasons the necessary equipment, of Swedish origin, will be fitted to the furnace next year.

Electricity for operating the plant is supplied by the Yorkshire Electricity Board through a ring main system at 11 kV to the melting shop sub-station. It is expected that when the furnace is in full operation the weekly power consumption of the plant will add nearly 1 million kWh to the 2 million kWh already being taken by the rest of the works, bringing total consumption up to a level comparable, for instance, with that of nearby Huddersfield.

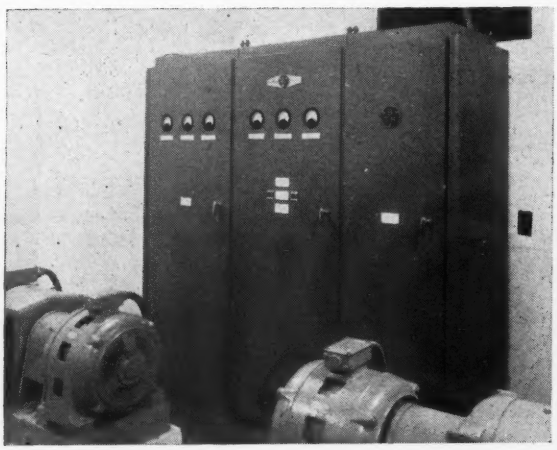
The furnace equipment is operated from the standard high voltage, three-phase, 50 c/s supply, while auxiliaries are run from a 440 V, three-phase, 50 c/s, four-wire a.c. supply.

Supply to the furnace transformer is controlled by a horizontal draw-out type, triple pole, oil immersed circuit breaker having a rupturing capacity of 250 MVA at 11 kV.

The furnace transformer, supplied by the English Electric Co., Ltd., is of 15,000 kVA, 11 kV, three-phase, 50 c/s rating, and is of the circulating oil filled type, the oil being cooled by pumping through an oil-water heat exchange system using some 100 gallons of clean water per minute. It is in two sections, the first transforming up from 11 kV to 22 kV, at which voltage the tappings are made, and the second section transforming down to the final output voltage. This voltage can be varied in 21 steps from 325 to 90, and it is a unique feature, so far as large arc furnaces in this country are concerned, that the tapping variations are made on load.

In the main transformer house accommodation is provided for the main 11 kV switchgear and associated control panels in addition to the furnace transformer room and control room. This equipment enables the incoming 11 kV supply to be conveyed either directly to the furnace and/or in conjunction with the existing 11 kV works ring main. A low voltage switchroom is also provided to distribute and control the outgoing supplies of 440 V a.c. power and lighting from a 1,500 kVA transformer in the basement and of 250 V d.c. power for cranes from a 350 kW mercury arc rectifier similarly situated.

The control desks have been manufactured by Birlec, Ltd., in conjunction with Samuel Fox & Co. The main panel comprises the necessary metering, indication and fault alarm equipment, and the desk panel houses the control switches for raising and lowering the electrodes.



The Amplidyne electrode control-gear cabinet and two of the electrode m.g. sets

Right: The control room for the 60-ton furnace is incorporated in the transformer house

Stresses and Strains

Rising Costs in the Electricity Supply Industry

From an Industrial Correspondent

DURING the past twelve months there has been a considerable stocktaking of the fuel and power industries, and particularly the electricity supply industry. This stocktaking has given rise to optimistic forecasts of the future of the industry.

The first five years after vesting day saw much of the leeway of the war years made up. And although this period was described by Sir Henry Self as the "five difficult years," it was, despite the limits imposed by Government policy and the physical limitations of the electrical engineering industry, a period of record expansion and development. Nationalization did at least bring integration of the power and distribution systems and place the industry under central control and direction. This, in turn, made possible national planning of development programmes, although it meant in not a few cases subordination of local needs to national requirements.

Admission of the initial successes of nationalization came when, in July, the Gas and Electricity (Borrowing Powers) Act increased the borrowing powers of the British Electricity Authority from £700 million to £1,400 million, to cover the Authority's generating plant programmes up to 1959–60 and, provisionally, to 1960–61. Under these programmes capital expenditure is to amount to £1,421 million and is expected to bring into operation 9,146 MW of additional plant.

This six-year plan has been described as "not over-ambitious," but its successful execution will not be free from internal stresses and strains. As with other industries, the biggest post-war problem of the electricity supply industry has been that of rising costs. Since vesting day rising costs have been most pronounced in fuel, capital charges and labour, the major components of revenue expenditure.

Fuel and Labour

Every report so far published by the B.E.A. has expressed concern at rising fuel costs. Between the first half of 1939 and the last quarter of 1949, the average pithead price per ton of coal to the industry increased by 167 per cent and the delivered price by 150 per cent (Second Report). The average delivered cost of British coal to power stations was 13·6 per cent higher in March, 1951, than in April, 1950 (Third Report); 11·1 per cent higher in 1951–52 than in the previous year (Fourth Report); 5·1 per cent higher in 1952–53 than in the previous year (Fifth Report); and 6·2 per cent higher in 1953–54 than in the previous year (Sixth Report).

Fuel, the industry's raw material, accounted in 1953–54 for 34 per cent of all revenue expenditure.

One of the first acts of the new electricity authority was to abolish the lower paid provincial zone. This established uniform rates throughout the provinces for manual workers, and meant in practice an increase of ¾d an hour for 11,000 employees. Shortly afterwards the holiday and sick schemes for manual workers and technical engineering staff were recast and improved. The administrative and clerical grades were accorded national negotiating machinery, with specified scheduled rates and improved working conditions. From then on, during the ensuing period of inflation, there followed successive increases in wages and salaries, a trend which continues.

The rising volume of labour costs can be illustrated by figures taken from the Authority's annual reports. In 1950–51 salaries, wages and superannuation cost £81·52 million, and accounted for about 22 per cent of all expenditure charged to revenue. In the following year this cost rose to £88·06 million, and it increased to £95·33 million in 1953–54. But even this jump of £7·27 million had increased the rate to only 22·3 per cent of all revenue expenditure.

Capital

The electricity supply industry has always carried heavy capital liabilities. Since vesting day these charges have shown a cumulative increase, and are expected to rise still further as the six-year plan gets under way.

In the First Report it was stated that the industry was employing "assets costing some £1,000 million to earn a gross annual revenue of some £200 million—a ratio of 5 to 1." Depreciation of these assets at the date of the First Report amounted to £30·61 million, or 15·49 per cent of the gross revenues of the industry. Added to this were interest charges, including interest on compensation stocks, totalling £15·85 million, or 8·02 per cent of gross revenue.

The First Report did not minimize the serious nature of rising capital charges. Indeed, it contained a warning that "in view of the greatly increased capital costs of construction which the Authority and the Boards now have to meet, as and when they are allowed to proceed with their development programmes, it is clear that capital charges will grow in relative significance, and that unless offset by increasing technical efficiency, coupled with expanding sales, the growing burden of capital charges may necessitate higher tariffs." The forecast of increasing capital charges proved in the event correct. But it is more than probable that the rate of increase has been greater than the Central Authority had allowed for in the first years of its operation. From a study of the annual reports, the following table can be built up:

Year ended 31st Mar.	Depreciation £ million	Percentage of gross revenues	Interest charges £ million	Percentage of gross revenues
1949	30·61	15·49	15·85	8·02
1950	33·62	15·68	17·55	8·18
1951	36·06	15·22	20·43	8·62
1952	38·85	14·72	22·83	8·65
1953	43·27	14·84	28·46	9·76
1954	48·74	14·93	32·63	9·99

Depreciation costs rose between 1949 and 1954 by about 60 per cent, and interest charges more than doubled. These items as a percentage of gross revenues rose only from 23·51 per cent to 24·92 per cent. During the same period combined revenues increased from £197·60 million to £326·53 million, or by 65·43 per cent. But while depreciation costs did not rise at the same rate as the industry's combined revenues, interest charges increased

by over 40 per cent more than the rise in combined revenues.

Sir Henry Self, writing in *The Times* Electricity Supplement (December, 1953), had much to say about rising capital costs, and was emphatic that "the increase in interest rates . . . has accentuated the burden of capital charges." He could also refer to the increasing costs of fuel and transport and of salaries and wages, which had rendered difficult the levelling out of tariffs to standardized forms. Well might Sir Henry draw attention to these charges for, according to the last report, fuel, labour costs and capital charges now account for 34·00 per cent, 22·30 per cent and 24·48 per cent respectively of all revenue expenditure, a total of 80·78 per cent.

Pull of Costs

Despite this year's record surplus of £13·19 million, the cumulative increase in costs since vesting day is developing a financial rigidity that may well cause strains and stresses within the industry. There is now a pull of costs at all levels and throughout all departments. While the B.E.A.'s attitude to further wage and salary increases has stiffened during the past two years, the unions have pointed to what they have described as "excessive increases" in other costs. In July, 1953, when the trade union side of the National Joint Industrial Council for manual workers put their case for "a substantial increase in wages," they recalled their estimate of the previous year of the effect of the increase in the bank rate on capital charges. This estimate, they claimed, had been confirmed by the *Economist* which had stated that the rise in the bank rate to 4 per cent would cost the Authority an additional £2¼ million on each year's capital outlay, including what the unions described as "inflated charges for new equipment." The unions calculated that this £2½ million was sufficient to give an increase of 2¼d per hour to each manual worker in the industry.

In a further application for an increase in wages lodged last March, the unions again returned to the increasing cost of capital charges. They produced figures to show that the average price of plant per kW installed had risen from £50 to £60 at vesting day to approximately £98 at the time of the application. They charged the Authority with selling electricity at a low price to manufacturers of electrical plant and paying them high prices for the equipment needed to carry out its development programmes. This had resulted in increased dividends and share bonuses of up to 100 per cent to the holders of electrical engineering shares. The unions said that an increase in the industrial tariff from the then price of 1·088d per kWh to 1·150d would produce an additional £12,727,000 a year from industrial sales. Sixpence per hour increase for 123,000 manual workers would amount to £7 million. Manufacturers of electrical equipment could easily afford the increase suggested without its being reflected in increased costs of their products.

On the technical side, the protracted efforts of the Electrical Power Engineers' Association to increase the salary scales and status of its members brought a new note of belligerency to its pronouncements. The general secretary, Mr. Harry Norton, in the Association's journal for January, 1954, wrote that although the Association had watched with concern the way in which continually rising coal costs, transport charges and plant prices cancelled out and of late more than cancelled out all the savings which skilled management and technical achievement of its members could make, it did not want the industry to become just another industry content to point to increasing costs as sufficient justification for equivalently increasing charges. But the Association had become critical and dissatisfied and it was time to speak out and also time for others to listen attentively and examine on their merits the facts which had brought about such a situation.

The Association's grievance was that since vesting day the status of the clerical staff in the industry had been inflated unjustifiably in relation to technical staff. That section of the clerical staff who worked near the centre, feeding detail to and in contact with the committee system on which the industry was operated, were given a status out of all proportion to their real importance to the industry, while the engineer—"solving his own problems and running his own show on the outer operations rim"—was forgotten and ignored. This was being reflected in the attitude of the Central Authority and the Electricity Boards to technical salaries and status. As a result "the man who makes steam is getting less money than the man who writes figures, and the man who designs substations is paid less than the man who frames minutes."

This note of belligerency was carried into twelve months' stubborn negotiations with the B.E.A., which resulted in revised schedules that have left E.P.E.A. members disappointed and no less belligerent. But whether the revised schedules are an "instalment," as the E.P.E.A. contends, or a "settlement," as the B.E.A. claims, the dispute clearly illustrates the pull of costs within the industry—this time at salary level.

It may be said that these stresses and strains, which are the result of continually rising costs to the industry, are not yet sufficiently pronounced to be of any immediate consequence or of serious import. It is true that there is no fear yet of an explosion in the industry. But with fuel, labour and capital charges, which already account for 81 per cent of all revenue expenditure, likely to rise still further, there is little room for manœuvre within the industry.

Trade with South Africa

Mr. Gerhardt Jooste, the High Commissioner for the Union of South Africa in the United Kingdom, was the guest speaker at the members' annual luncheon of the British Engineers' Association in London on 9th December. He was introduced by the president of the Association, Mr. H. S. Broom, who spoke of our increasing engineering exports and the rising prestige of British manufacturers in overseas markets.

Mr. Jooste said that differences between nations were too often overstressed, to the neglect of matters of common interest. In war and peace the United Kingdom and South Africa were among each other's best customers. Trade between them had grown phenomenally and at the same time South African industry had developed on a large scale, the output rising in value from £200 million in 1939 to £1,000 million in 1953. Yet most South African industries met only a part of the Union's requirements; the Union still needed to import a great deal and a large margin would continue to exist.

After the war foreign exchange shortage resulted in import controls and restrictions and they were compelled to devote foreign exchange to the purchase of equipment and raw materials for electrification and other developments. United Kingdom machinery and electrical equipment manufacturers had shared in the buoyancy of the South African market. British manufacturers would be wise to ensure that the growing demand for their products did not prevent them from keeping to delivery promises and quoting firm prices.

If manufacturers kept a vigilant eye upon the significant change in the character of South African import requirements they would still find that there was a very profitable market in South Africa.

A vote of thanks to the speaker was proposed by Mr. W. K. G. Allen, vice-president of the Association.

Engineering in Europe

Abstracts from Foreign Technical Journals

THE method of cutting metals by spark-cutting has a big future because it is particularly suitable for machining hard and heat-resistant steels and alloys and is also simple and convenient. The main factors determining the economic importance of this method are the output and wear of the revolving cathode disc.

Investigations have shown that these factors depend largely on the chemical composition and physical state of the inter-electrode fluid used. In particular, cathode wear is greatly reduced if the fluid contains elements whose electron work function is small and even more if it can be reduced by using certain compounds and salts of these elements.

The minimum wear is obtained with composite solutions containing boric acid, borax, potassium borate, etc. The output does not depend on the chemical composition, but on the physical state of the fluid and in this respect colloidal solutions and stable suspensions answer best, the output rate being two to four times higher than when water is used. The author attributes this effect to the reduction of the thermal conductivity of the medium.—"Influence of the Composition of the Inter-Electrode Medium on the Wear of the Cathode Disc and Output in Electric Spark-Cutting of Metals," V. K. Nevezhin, *Elektrichestvo*, No. 8, pp. 52–57, 1954, in Russian.

Installing Series Capacitors

The main advantages obtainable by the use of series capacitors in transmission lines are increases of the limits of static and dynamic stability, enabling the transmitted powers and overload capacity to be also increased; possibility of achieving given load distributions between parallel lines; improvement of the voltage control; and reduction of transient reactance of synchronous motors. The author gives a representation of the theory of these effects with an approximate estimate of the economic advantages achievable by the installation of capacitor banks. These are checked on data available from Swedish and American installations actually operating. Joint operation of static capacitors and synchronous condensers is also considered.

Among the technical problems arising in connection with the installation of series capacitors are the choice of the correct capacitor rating, the behaviour of the capacitors under atmospheric surges and when hunting of the generators occurs, under short-circuits in the system and, on the other hand, the effects of the capacitors on the consumers' machinery supplied by the system, and finally the protection required by the capacitor banks. Two mathematical appendices supplement the theory outlined in the main part of the paper by showing how to calculate concrete cases.—"Purposes and Methods of Installing Series Capacitors in Power Systems," G. Musio, *Energia Elett.*, Vol. 31, pp. 502–516 July 1954, in Italian.

Eddy Current Losses

The annular potential shields which are inserted at the ends of the windings of v.h.v. transformers are slotted and may form the input turn of the winding. They ensure a uniform potential distribution at the ends of the winding and reduce the input wave impedance of the transformer. By capacitively charging the front turns of the first coil they make the voltage distribution on them almost linear, so improving their safety against surge dangers. Even in a purely mechanical sense the potential shield reinforces the winding.

The leakage field of the transformer induces eddy currents in the shield which are superposed on the working current, so that the current density becomes non-uniform and sets up an additional field superposed on the leakage field. The determination of this resultant leakage field is not easy and must start with the analysis of the undisturbed leakage field into which the shield is inserted.

The author assumes the ring to consist of a non-magnetic material and uses Maxwell's equations for determining the eddy current losses from the radial and axial components of the magnetic field at the position of the shield. An alternative decomposition method suggested by Hak is also discussed. The practical application of the method is illustrated on a fully worked example relating to a 31·5 MVA transformer.—"The Eddy Current Losses in the Potential Shields of a Transformer," D. Mayer, *Elektrotech. Obzor*, Vol. 43, No. 8, pp. 431–439, August 1954, in Czech.

Dielectric Strength of Oils

One of the fields in which the existing internationa bodies have not yet produced anything like a close approach to each other of the national regulations in force, is that of testing insulating oils, thus making it quite impossible to refer test results obtained on the basis of one nation's regulations to results obtained under other regulations. The differences are so great because they refer not only to test methods or procedures, but also to the equipment used, particularly test cups, electrode shapes and gaps, etc.

This is further aggravated by the lack of sufficiently accurate instructions on the sampling procedure in all the regulations which is a factor causing considerable dispersions of the results of measurements even of the same oil by the same method and apparatus. Considering these facts, it must be admitted that an approximate formula which was suggested for converting test results obtained with any "national" equipment to an internationally accepted type of test cup, viz., the U.S.E. test cup with 2 mm electrode spacing, is only of problematical value.

The two authors have designed a test cup of a very special shape which they claim to be more suitable as a standard model because it avoids some of the disadvantages of other types which in the majority of cases were designed when the requirements for dielectric strength were much below those of the present time. The authors also discuss desirable redefinitions and reclassifications of the oils according to their dielectric strength and the possibilities of maintaining the dielectric characteristics of oils by keeping them in inert gas atmospheres.—"Measurement of the Dielectric Strength of Insulating Oils," H. Josse and Y. Enault, *Bull. Soc. Franc. Elect.*, Vol. 4, No. 45, pp. 536–542, September 1954, in French.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

Brushless Variable-Speed Motor

THE discussion on the paper given by Prof. F. C. Williams and Mr. E. R. Laithwaite at the Institution of Electrical Engineers and summarized in the *Electrical Review* of 10th December was opened by Prof. J. C. Prescott (King's College, Newcastle). When the directions of the field and the disc were the same there was, he said, no braking torque; therefore, one would expect the efficiency of the motor to be higher at minimum speed, but that did not seem so from the performance curves.

While utilization of material would be better for a cylindrical rotor it would still be considerably lower than for an ordinary induction motor, because a stator could not go right round the rotor and there would be considerable gaps in its periphery. Displacement of the field might be obtained by having a separate winding on the rotor, one set of poles running round and one set running across.

Mr. G. B. Alvey (Mather & Platt) said that present designs of variable-speed rotors, with insulated windings, commutators and slip-rings, were not suitable for high speeds, whereas induction motors of 5,000 h.p. capacity were operating at 3,000 r.p.m. The authors' machine, if it could be developed for those capacities and speeds to give variable-speeds that were stable with load, would have a great future. It might also have an application, if the speeds could be worked up, in very foul chemically impregnated atmosphere.

Prof. G. H. Rawcliffe (Bristol University) pointed out that turning the poles had the same effect as moving them in and out. This might be more convenient, but it incurred a braking effect. If they were moved in and out there would be little or no braking effect. Although the present machine might be far from commercial application, a brushless variable-speed induction motor would bring about the end of d.c. systems.

Dr. E. Friedlander (G.E.C., Ltd.) related that some twenty years ago he investigated a three-phase induction heater which was roughly along the lines of the stators used by the authors. To get rid of forces detrimental to the heater the phase-sequence on half the conductors was reversed. The next step was to build a motor on the authors' lines but with variable radius, but an old patent was found to illustrate precisely the same device.

Mr. W. Hill (Metropolitan-Vickers Electrical Co.) said that the authors had presented the first type of variable-speed induction motor ever made. No information was now available, however, on stray load losses, for instance, and very little on dips in speed curves and on mechanical reliability of the so-called " indestructible " motor.

Mr. O. I. Butler (Sheffield University) said that the cylindrical construction was very desirable. The ultimate application of the principle would depend more on mechanical than electrical ingenuity in solving what was essentially an electro-mechanical problem. The authors' motor was akin to a shunt-wound d.c. motor and an arrangement corresponding to Ward-Leonard control might be necessary to make it a good practicable machine. Mr. David Morris showed diagrams illustrating the appendix to the paper.

Engineering in the Twentieth Century

AS the subject of his presidential address to the Junior Institution of Engineers last Friday, Prof. S. J. Davies (London University) took the developments in engineering practice in the twentieth century in relation to the distribution of different degrees of skill among those engaged both as producers and users. After outlining the most important stages of progress, which included the grid, expansion of the telephone service and broadcasting, he discussed the effects of a greater knowledge of older materials of construction and the introduction of new ones.

No single step, he believed, had been responsible for greater developments than interchangeable production which was found generally necessary for quantity production during the first world war, although Whitworth had pioneered the system in the middle of last century. Before 1914 the industrial strength of Great Britain rested upon the treatment of each individual product as a unit requiring high skill of craftsmen, but interchangeability of components enabled further use to be made of unskilled labour. The second world war accentuated this trend. The result of mass-production methods was to increase the productivity of each person and to bring a higher standard of living, especially for lower paid workers. To reduce wage costs operations would be increasingly mechanized with a tendency to the reduction of unskilled operations, but to the increasing demand for skill in the production of equipment.

Prof. Davies also referred to the very great extension and application of research facilities in Great Britain since the beginning of the century, at which time these lagged far behind other industrial countries. Nowadays they constituted one of the best auguries for future prosperity. Accompanying this alteration in outlook was a trend, brought about by improvements in communications, towards discussing technical problems internationally, which replaced an insular point of view without loss of practical approach to scientific problems.

Testing Alternator End-Windings

THAT short-circuit tests at full voltage on large alternators, having regard to the usual remoteness of the load they supply and the intervention of step-up transformers, are unnecessarily severe, was the submission of Messrs. J. B. Young and D. H. Tompsett (English Electric Co.) in a paper presented on 15th December before the Supply Section of the Institution of Electrical Engineers. After referring to the possibility of the electromagnetic forces acting on the stator end-windings outside the slots reaching 400 times the normal value they described the difficulties of assessing analytically the likely damage to the insulation.

The correlation of analytical work with practical experience was investigated with reference to a 60 MW 60 c/s 13·8 kV 3,600 r.p.m. alternator for Canada, which was required by the specification to be subjected to a solid three-phase short-circuit test from 100 per cent of normal voltage on open circuit. As a direct result the windings subsequently failed to withstand for one minute the final insulation test (at twice the working voltage plus 1 kV, i.e. 28·6 kV) after having previously withstood 30·6 kV between phases and to earth for one minute. This led to the suggestion that if, after reviewing available data, it was still felt that the stator windings should be tested at full open-circuit voltage at the machine terminals, such a test should be applied not to the actual windings but to a short-cored but otherwise full-scale replica. Various factors contributing to the severity of short-circuit forces in service and under present test conditions were described. These indicated that, taking account of probable arc resistance and decrease in asymmetry, a reduction to 66 per cent of the maximum was to be expected in practice, the reduction in forces varying as the square of the current.

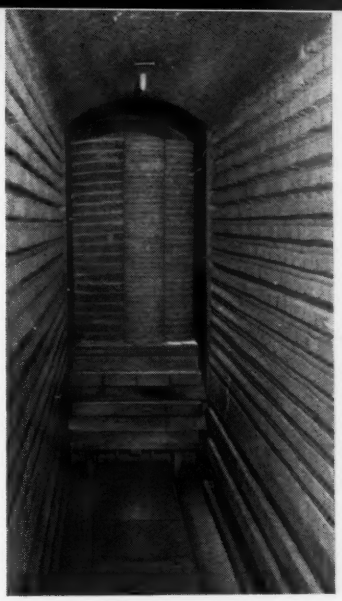
Closing of a machine on to a system 180 deg out of phase would, with typical reactance values, be only 80 per cent of those from a solid short circuit on the generator at normal voltage under the worst condition, with a reduction to 66 per cent of the forces on the conductor. Data concerning operational faults, to be supplied by the B.E.A., should be studied to obtain agreement on a more realistic short-circuit test before machines were despatched.

Docks and Railway Yard Lighting

The improved lighting of docks and railway yards as an aid to speedier handling of freight formed the subject of an address given by Mr. W. T. Souter, sales director of Holophane, Ltd., at the December meeting of the Glasgow Centre of the Illuminating Engineering Society.

Firing China Biscuit

New Electric Kiln for Intermittent Use



The interior of the Shelley kiln is lined with insulating bricks which are reasonably good electrical insulators at high temperatures. These bricks are backed with a layer of lower grade insulating bricks and the outside is cased with ordinary building bricks

DETAILS of a new intermittent electric kiln for the biscuit firing of china has been given to us by Mr. H. A. P. Caddell, manager of the North Staffordshire Sub-Area of the Midlands Electricity Board. This new kiln has been designed jointly by Mr. S. Scholefield, A.M.I.E.E., the Sub-Area commercial officer, who has for many years been interested in the application of electricity to the pottery industry, and Mr. Donald Shelley, of Shelley Potteries, Ltd., Longton, manufacturers of bone china.

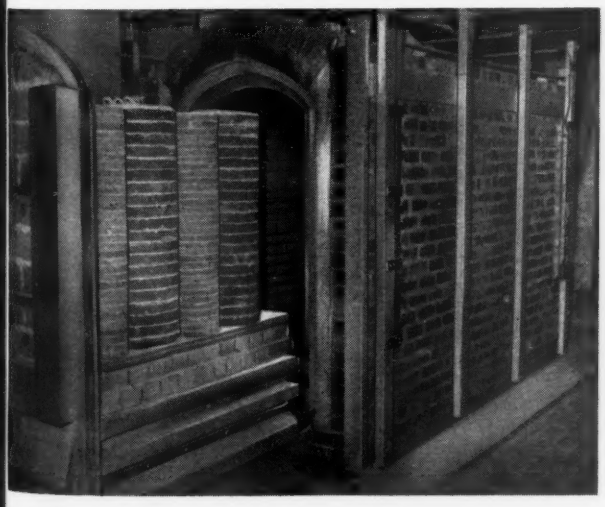
On 31st July, 1953, we referred to the construction by Spencer Stevenson & Co., Ltd., of Longton, of twin electric decorating kilns to the design of Mr. Scholefield. These kilns, each 2ft wide, 4ft 6in long and 3ft 6in high, have proved entirely successful for the firing of china decoration at temperatures between 650 deg and 750 deg C and as a test they have been taken up to the glost firing temperature of 1,080 deg C. The pair produced a load factor of over 90 per cent.

After visiting these decorating kilns, Mr. Shelley asked Mr. Scholefield to co-operate with him in the construction of an experimental kiln to fire china biscuit. Assistance was called for from the British Ceramics Research Association and from the Morgan Crucible Co., Ltd., and within two months construction of a kiln was completed at the premises of Shelley Potteries, Ltd., the electrical equipment being lent and installed by the M.E.B.

The kiln constructed is 9ft long, 2ft wide and 3ft 6in in height, with two trucks, each 4ft 6in long, with its own brick doors for entering the kiln at opposite ends. The kiln, trucks and doors are lined with insulating bricks of the highest grade (M.I.28) supplied by Morgan Refractories, Ltd., which are reasonably good electrical insulators at high temperatures. These bricks are backed with a layer of lower grade insulating bricks, and the outside is cased with ordinary building bricks.

The heating elements used in this kiln are constructed from Kanthal A.1 (10 s.w.g.) wire, an alloy of iron, aluminium, cobalt and chrome. About 120 lb of this wire was installed at a cost of 35s per lb.

Shelley kiln showing truck placed for firing flat ware



Recessed into the walls of the kiln are fifteen elements on each side, with a loading of 5·7 W per sq in, and there are three additional elements built into the deck of each truck, and ten in each door, with the object of providing a uniform firing temperature throughout the kiln—an important factor in the successful firing of high grade china. Firing is controlled by an automatic switch which is preset to the required temperature of 1,250 deg C, and a safety device ensures that the trucks, with their built-in heating elements, cannot be removed while the power is switched on.

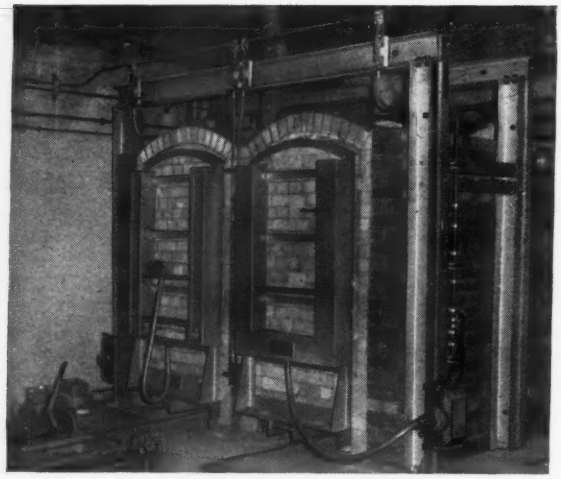
There are two small outlets in the roof of the kiln to allow moisture to escape during the early stages and the fluorine during the later stages, and for cooling purposes. There are also three trial holes in each door, through which heat indicators can be observed, for use as a check on the firing and trials withdrawn at any stage in the firing. No fans are required during the firing or cooling of the kiln.

The kiln has capacity for about 150 dozen cups, or about 200 dozen saucers, or 60 dozen of large flat ware in single setters. The ware is fired in between 23 and 24 hours and cooled in about 18 hours. By the use of spare trucks, the kiln has a firing cycle of 48 hours, and can therefore be fired three times during the working week. It is intended that these kilns should be built in pairs, to provide a continuous electrical load, one kiln firing while the other kiln is cooling, and as one kiln is fired up and switched off, the other one is switched on. If desired the kilns can be arranged to take a light load only.

Electricity consumption averages about 1,250 kWh per firing, at a cost of 0·9d per kWh, giving a fuel cost of £4 10s. Fuel costs, therefore, compare favourably with the coal fired intermittent oven, as about nine firings of this small kiln give an output equivalent to that of one 14ft coal oven.

Many pottery manufacturers have seen the kiln in operation and have had trial firings of their ware in it, and Wade Heath & Co., Ltd., of Burslem, are already constructing a double unit for the firing of their earthenware biscuit up to a temperature of about 1,150 deg C. Two firings have been made of large fireclay kitchen sinks on behalf of another manufacturer, who is building himself a kiln with which to carry out further experiments.

Commenting on the kiln, Mr. Norman Shelley, senior member of Shelley Potteries, Ltd., said that every kind of china biscuit had been fired in it, and he thought it was ideal for firms which placed quality first in the



Wade Heath kiln showing right hand unit firing and left hand unit placed ready for firing

firing of bone china. The loss from this kiln was very small and could not be blamed on the firing, and they estimated that the total cost of firing in these kilns, including repairs and replacement of furniture, would be about half of that of their existing coal ovens. No saggars were needed, no night work, no week-end work, no holiday work, and no casual labour was required for drawing. A two-truck kiln could easily be emptied and refilled by one placer within the day.

The kiln could well be constructed by smaller manufacturers with insufficient room in their factories for the present tunnel ovens and its use would contribute to smoke abatement. The capital outlay in building a battery of these kilns was very much less than for a tunnel oven of equivalent capacity, and they could be built one at a time and brought into commission without disturbing the output of the factory. They were already working on a plan to construct a number of these small kilns and they intended gradually to change over their firing from their present coal ovens to the new kilns as they were constructed.

One great advantage of this method of firing was that each type of ware could be fired separately to receive the correct heat treatment and to develop maximum translucency, maximum strength and minimum porosity. All the disadvantages of the tunnel kiln were eliminated—the pile-up and loss of output during repairs, the problem of maintaining temperature during holiday periods, and the annual overhaul during the Wakes week.

Mr. Shelley added that his firm had just completed the construction of two intermittent electric decorating kilns, based on the design already used by Spencer Stevenson & Co., for the firing of special decorated ware which needed a higher temperature firing than normally used in their present continuous kiln.

Mr. Caddell considers that with the aid of these kilns it may be possible to get rid of the smoke problem in the Potteries within five years.

The following firms co-operated in the construction of the new kiln: Morgan Refractories, Ltd. (insulating bricks); Brentford Transformers, Ltd. (low voltage transformer); Bramall (Engineers), Ltd. (trucks and ironwork); Hall & Pickles, Ltd. ("Kanthal"); Ether, Ltd. (temperature control); E. N. Bray, Ltd. (contactors); and the Acme Marl Co., Ltd. (kiln furniture).

Cathodic Protection

IN view of the increasing use of cathodic protection to buried structures it is interesting to learn that a committee has been formed for the purpose of co-ordinating the application of this method. Although the records are not yet complete, information has already been received on some 200 installations which are either in operation or projected. Installations of impressed current or reactive anodes are in use on water, gas, oil and sewage pipes, telephone and electricity supply cables and structures such as oil tanks and jetties.

The need for co-ordination arises largely from the fact that current circulating in the soil due to a cathodic protection installation may accelerate the corrosion of nearby structures. Methods of assessing the probability of damage in particular cases are being studied. One method of preventing such harmful interaction is to extend the cathodic protection to neighbouring structures by connecting them to the protected structure, with suitable safeguards where necessary, either directly or through resistors or other devices. It is, therefore, necessary to consider the conditions under which such interconnection of buried structures is permissible.

Membership of the committee has been confined to representatives of organizations or industries responsible for buried structures through ownership or otherwise. At present the organizations represented are the British Electricity Authority, the British Transport Commission, the Gas Council, the General Post Office, United Kingdom Pipelines, and the Water Research Association.

Since it will ultimately be necessary to make the findings of the committee generally available in the form of a Code of Practice, a technical panel has been set up having the following terms of reference:—"To study cathodic protection with a view to the eventual drafting of a Code of Practice, with special reference to the possibility of cathodically protected systems endangering adjacent buried structures, and to joint protection schemes."

The membership consists of one representative of each of the organizations listed above, together with Dr. F. Wormwell, representing the Department of Scientific and Industrial Research, who is chairman of the panel. Arrangements have been made to ensure liaison with the British Cast Iron Research Association, the British Electrical and Allied Industries Research Association, the British Iron and Steel Research Association, and the British Non-Ferrous Metals Research Association.

Italy-Sicily Transmission Line

OUR Rome Correspondent reports that good progress is being made with the scheme for constructing a transmission line across the Strait of Messina linking Calabria, on the Italian mainland, with Sicily. Two steel towers 224 metres high have been completed at Punta Faro, on the Sicilian coast, and in Cannitello (Calabria). During this month conductors will be suspended between these towers, a distance of 3,653 m, believed to be the longest overhead line span in the world, and in January, three years after the beginning of work, the line is expected to be ready for service.

The towers, each weighing 450 metric tons, will support six conductors for two three-phase circuits. Tests have shown that each tower will be able to withstand winds up to a velocity of 150 km/hr and a longitudinal pull of 25 metric tons applied at any point. The total cost will amount to about 2·5 milliard lire (£1½ million).

VIEWS on the NEWS

By REFLECTOR

INTERESTING comments on electricity costs were made last week by Alderman W. J. Bennett, chairman of the Eastern Electricity Consultative Council. After announcing that the Eastern Board would need an extra £3,000,000 revenue a year by the end of 1956/57, he said that so long as the financial structure remained as it was the Council saw no alternative to raising tariffs. It had always felt that the industry should be considered as a whole, but the Central Authority thought that each Board should be regarded as a financial entity and pay its way. Last year one half-hour of peak demand had cost the Eastern Board half a million pounds, which he regarded as a "book transfer," hence the profit of £13¼ million on the industry. In an informal talk afterwards he said that "children's hour" on television, which overlapped the commercial and industrial load, had a serious effect on the peak demand. If it were shifted only half an hour it would save them a power station. This saving, I find, would not apply to the whole country, for last year only three of the fourteen Boards experienced their maximum demands in the evnieng. Incidentally I am told that the loading of a modern television set is about 150 W compared with the 250 W of earlier models.

* * *

Last year the Birmingham Corporation approved a scheme for allowing old age pensioners to ride free on its transport system. About two months ago Mr. Justice Vaisey, at the instance of a ratepayer, decided that the scheme was invalid and *ultra vires*. The Corporation considered an appeal but decided instead to promote a Parliamentary Bill to legalize the scheme. In his judgment Mr. Justice Vaisey mentioned that the Birmingham transport system was running at a loss to which the free-travel scheme would add £90,000 per annum. His Lordship held the view that, while it might be in order for a local authority to grant such privileges to children, cripples, invalids and wounded ex-Service men, it was not permissible to grant them to people purely because of economic disability. The subsidizing of particular classes of society was a matter for Parliament. I refer to this matter mainly because it has been suggested in some quarters that Electricity Boards should make special price concessions to old age pensioners. Sympathy for the plight of old and poor people must not be allowed to veil the undesirability of subsidizing them locally instead of nationally.

* * *

The inauguration of a 30 MW extension of the Pinkston (Glasgow) power station, raising the capacity to 87·5 MW, has occurred at a time when it has been proposed that the Glasgow tramway system, which the station serves, shall be replaced by oil-engined buses. It has been suggested that the station might be sold to the British Electricity Authority (or more properly now to the new South of Scotland Electricity Board). While Pinkston would be a welcome addition to the electricity supply system of the area, no doubt, I think it is much more desirable that the station should continue to serve its original and present purpose—to provide electricity for traction. If Glasgow is determined to get rid of its trams that purpose could still be maintained by the introduction of trolley-buses.

* * *

At Ipswich, according to the *Evening Star*, although the Eastern Electricity Board is responsible for the street lighting, any digging and filling-in of holes for the purpose is apparently the prerogative of the Corporation. Recently when two lamps failed two holes were dug and when the work was completed the Board sent in a reinstatement notice. One hole only was filled in as the notice was incomplete. Inquiries made by a reader and a reporter of the newspaper resulted in the disowning of the hole by both Board and Corporation, but eventually the Corporation decided to fill it in. It may be that something of this sort is the explanation of the holes in London, many of which seem to remain for an inordinately long time.

* * *

An article in the Glasgow *Evening Times* puts forward all the well-known arguments in favour of railway electrification—cleanliness, comfort, better running, etc.—for the consideration of the Glasgow Transport Committee which is discussing means of dealing with the city's transport problems. The heading of the article, "Electric Trains would mean a Longer Lie" does not indicate extended prevarication but covers an additional benefit mentioned in the article:—

> "Quicker off the mark, such trains would reduce the time of the journey by several minutes and allow you those extra few minutes in bed in the morning."

Or, conversely, of course, enable you to get to work earlier.

* * *

Fifty years ago electric traction was a dominant subject in the columns of the *Electrical Review*. For example in the issue of 16th December, 1904, there were illustrated articles on the Spindlersfeld (Germany) 6 kV single-phase railway system; the Wakefield and District Light Railways with their own 1,200 kW (m.c.r.) power station; the Kilmarnock electricity and tramway system; and "Some Notes on High-speed Electric Railway Work" by F. W. Carter. There was also an account of the first public run from Baker Street to Uxbridge in one of the Metropolitan Railway Company's new electric trains; this was the inauguration of electric traction on the company's system and there was later a rapid conversion of the rest of the lines. The beginning of the electrification of the London–Brighton line was foreshadowed—the conversion of the Victoria–London Bridge section and other notes reported the inauguration of the Musselburgh lighting and tramway system and of the Preston Corporation tramways. The "Contracts Open" section included items from the Great Western Railway (conductor rails, etc., for the electrical equipment of the Hammersmith and City Railway) and from Glasgow Corporation (100 electric car motor equipments and spares).

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. A. G. R. Bell, A.M.I.E.E., A.M.I.Mech.E., station superintendent, Bromborough power station, has been appointed as generation engineer (operation) in the South Western Division of the British Electricity Authority with effect from 1st January next.

Mr. P. R. Dunn, B.Sc., M.I.E.E., has been appointed chief engineer of British Insulated Callender's Cables, Ltd. He succeeds **Mr. D. T. Hollingsworth,** who has recently been appointed to the board of the company. Educated at King Edward's School, Birmingham, Mr. Dunn afterwards studied electrical engineering at Birmingham University, gaining the degree of B.Sc., with first-class honours. In 1925 he joined British Insulated & Helsby Cables, Ltd., as a construction engineer on the installation of mains cables and overhead equipment for railway electrification. This was followed by a period of investigation and development work on h.v. cables and on factory processes. In 1932 he was appointed sales engineer in the company's Manchester area and in 1939 became assistant to the chief engineer. After the formation of B.I.C.C. in 1945 he was engaged largely in technical liaison matters until being appointed deputy chief engineer in 1952. Mr. Dunn is a past president of the North Western Branch of the Association of Mining Electrical and Mechanical Engineers and of the Manchester and District Branch of the Institute of Welding. He is the present chairman of the Mersey and North Wales Centre of the Institution of Electrical Engineers.

Mr. P. R. Dunn

The Minister of Fuel and Power has re-appointed **Mr. R. W. McCrone,** M.C., B.Sc.(Eng.), A.M.I.C.E., of Charlestown, Fife, **Mr. G. McLaren,** C.B.E., J.P., of Stenhousemuir, Stirlingshire, **Sir Ronald Thomson,** D.L., of West Linton, Peeblesshire, and **Sir Ernest Wedderburn,** O.B.E., D.L., D.Sc., LL.D., W.S., of Edinburgh, as part-time members of the South East Scotland Electricity Board, until 31st March, 1955, when the Board will cease to exist by virtue of the Electricity Reorganization (Scotland) Act, 1954. The Minister has also re-appointed **Mr. R. Allan,** of Yoker, Clydebank, **Colonel J. G. Crabbe,** O.B.E., M.C., J.P., of Duncow, Dumfries, and **Mr. Jackson Millar,** C.B.E., D.L., J.P., of Glasgow, as part-time members of the South West Scotland Electricity Board until 31st March, 1955, when this Board will also cease to exist.

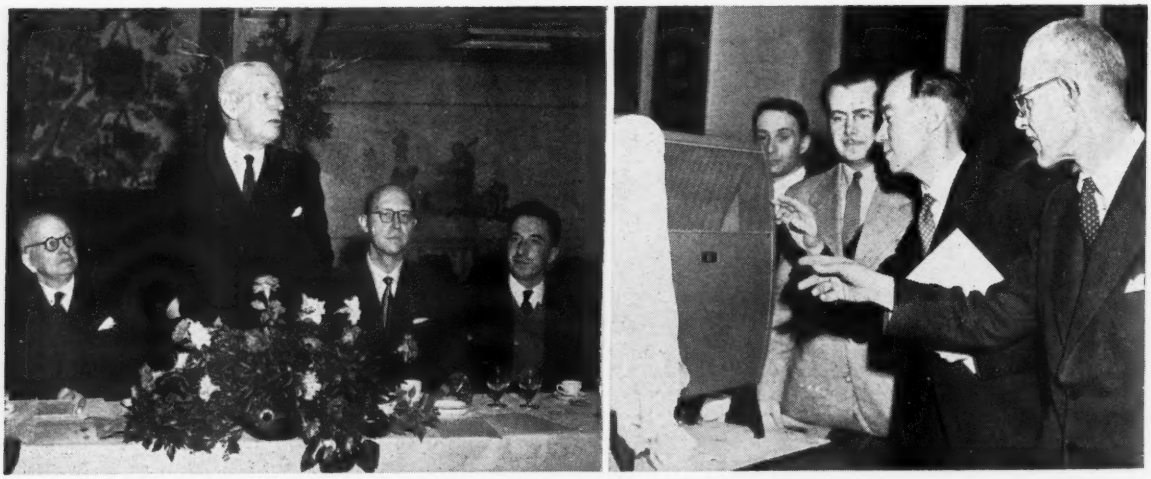
The International Commission on Rules for the Approval of Electrical Equipment (**C.E.E.**) had a series of meetings at the British Standards Institution, 2, Park Street, London, from Monday, 6th December, to Saturday, 11th December, inclusive. The subjects under discussion were lighting fittings, portable tools, and fuses. On Wednesday the members of the C.E.E. were entertained to luncheon at the Burford Bridge Hotel by the Electrical Development Association. After lunch they visited the E.D.A. Testing House at Leatherhead.

The B.B.C. announces the appointment of **Mr. C. R. Jephcott,** A.M.I.E.E., as engineer-in-charge of the new temporary television transmitting station at North Hessary Tor, South Devon. Mr. Jephcott joined the Corporation in 1935 at the Droitwich transmitting station, where he became a senior maintenance engineer in 1941. In 1946 he transferred in that capacity to the short-wave transmitting station at Skelton, Cumberland, which post he has held until taking up his present appointment.

Mr. R. C. F. Saxby has been appointed contracts manager of Cable & Wireless, Ltd., as from 1st January next. He will succeed **Mr. H. V. Higgitt,** who is due to retire on 31st December. **Mr. G. W. T. King** will succeed Mr. Saxby as assistant contracts manager.

Mr. Saxby joined the Eastern Telegraph Co., Ltd., in 1921. He transferred to Cable & Wireless, Ltd., when the company was formed in 1929 and went to the engineer-in-chief's department in 1939. Mr. Saxby joined the Contracts Department in 1942 and was appointed assistant contracts manager in 1947.

Mr. King joined the Western Telegraph Co., Ltd., in 1922, and was appointed to the Stores Department,



Left: Mr. Victor W. Dale (director and secretary, E.D.A.) welcoming the C.E.E. members. On his right is M. Duraty de Grandpré (France) and on his left Mr. A. Tschaler (Switzerland) and Mr. C. Keymeulen (Belgium). Right: Mr. N. Blight (United Kingdom), Mr. G. Nemeth (Hungary), Mr. H. W. Baxter (United Kingdom) and Dr. V. Karaday (Hungary) watching convector heater safety tests

later re-named the Contracts Department. He transferred to Cable & Wireless, Ltd., on its formation, and in 1930 joined the secretary's office and took charge of the insurance, shipping and accounts section in 1941.

Mr. Higgitt has been with the company for forty-two years; he served in cable ships during the early years of his career. He joined the head office in London in 1920, and has been actively associated with developments in submarine cable and radio telegraphy. He invented the signalling system known as double current cable code, by means of which two separate channels of communication can be sent over a single radio path. Mr. Higgitt was appointed assistant engineer-in-chief in 1936 and contracts manager in 1950.

The **Telegraph Construction & Maintenance Co., Ltd.,** held its annual dinner and cabaret at Claridge's, London, on 8th December. Mr. J. N. Dean, chairman of Telcon, presided, and the guest of honour was Sir Edward Boyle, Bt., M.P., Parliamentary Secretary to the Ministry of Supply, who proposed the toast to the company. Lieutenant-General Sir Ian Jacob, K.B.E., C.B., director-general of the British Broadcasting Corporation, responded to the toast to the guests which was proposed by Dr. E. W. Smith, director of Telcon. The cabaret, which was introduced by Joan Gilbert, included Terry Thomas, Shirley Abicair, Marion Ross and Jack and Eddie Eden. The electrical, communications and radio industries, as well as several Government Departments, were represented at the gathering.

Mr. H. W. M. King has been elected vice-chairman of Geo. W. King, Ltd. He has been with the company for thirty-five years and has been a director since 1946. Mr. King is on the National Council of the Engineering and Allied Employers' Federation.

Mr. E. Burgoyne, deputy manager, Worcester and District Sub-Area of the Midlands Electricity Board, has been appointed for special duties directly responsible to the deputy chairman, to carry out a review of all the Board's premises in the interests of economy and improved efficiency. The need for the review has been brought about by restrictions and shortages in the past which have prevented the provision of suitable accommodation in order to keep pace with the development and expansion of electricity supply in the Board's area.

Bailie J. Sullivan, of Glasgow, retired from part-time membership of the British Electricity Authority on 30th November, on being appointed a member of the new South of Scotland Electricity Board with effect from 1st December.

Mr. J. J. Jordan, manager of the Cardiff branch of Philips Electrical, Ltd., completed twenty-five years' service with the company on 2nd December. To mark the occasion he was presented with an inscribed gold watch and a cheque by Mr. G. Hofman (managing director) on 3rd December, and a celebration luncheon was afterwards held.

The twenty-fourth annual ball of the **Electrical Industries Benevolent Association,** Northern Counties Area, was held at the Old Assembly Rooms, Newcastle-on-Tyne, on 7th December. Mr. J. C. Mitchell, Divisional Controller, North Eastern Electricity Division, and chairman of the Northern Counties Area E.I.B.A. Committee, and his daughter-in-law, Mrs. J. W. W. Mitchell, received 300 guests, and were supported by Mr. J. Gibson, chairman-elect.

Mrs. R. H. Davison presenting a bouquet to Mrs. J. W. W. Mitchell at the E.I.B.A. Northern Counties Area Ball. With them are Mr. J. C. Mitchell and Mr. J. Gibson

The **Ipswich and District Electrical Association** held its annual dinner at Ipswich on 3rd December, when Mr. H. E. Wright (chairman of the Association) presided over a company of 240 members and guests. Mr. A. F. Plummer, president of the Electrical Contractors' Association, in proposing the toast of the Association, complimented it upon its work. He said that peace within the industry was an absolute requisite for its future prosperity. Responding, Mr. Wright reviewed the history of the Association since its formation in 1933. Mr. E. P. Tetsall proposed the toast of the electrical industry. He said that its inception and growth was a romance of trade and commerce which touched life at every point. In this country, we had not the natural forces to build the great generating stations he had seen in Sweden and Canada, so that there was an increasing strain on the supply of coal for our plants. This would be so until we moved to the fullness of atomic energy. Mr. C. T. Melling, chairman of the Eastern Electricity Board and president of the Association, said that we depended on electricity for our national productivity. Mr. S. Hardy, vice-chairman of the Association, proposed the toast of the guests and the Mayor of Ipswich (Alderman C. G. Roper, J.P.) and the Bishop of St. Edmundsbury and Ipswich (Dr. A. H. Morris) responded.

Mr. E. A. Wilbraham, special colliery representative of the Liverpool Electric Cable Co., Ltd., is retiring at the end of this year and will be succeeded by **Mr. J. Atherton.** Mr. Atherton received his training at the Royal Technical College, Salford, and after serving an apprenticeship with Switchgear & Cowans, Ltd., joined the Liverpool Electric Cable Co. in 1934. He served as head of the Test Department for several years, being transferred to the sales staff in 1945. He was appointed branch manager at Nottingham in 1949.

Mr. R. F. A. Baldwin, general manager of the Electrical Department of W. B. Dick & Co., Ltd., has been appointed a director of the company.

Mr. Percy Evans, general sales manager of the Hopkinson Electric Co., has been appointed to the board with the title of sales director.

Mr. F. Gowdridge, manager of the Coalville district of the East Midlands Electricity Board, has been appointed manager of the newly formed Tamworth and Coalville district.

The first annual dinner of the **Ediswan (London and District Offices) Long Service Association** was held on 26th November at the Horse Shoe Hotel, London, where a gathering of seventy-five members from London

At the annual dinner of the Ipswich & District Electrical Association. Left to right: Mr. H. E. Wright, Ald. C. G. Roper, Mr. A. F. Plummer, Dr. A. H. Morris, Mr. C. T. Melling and Mr. E. P. Tetsall

and the provinces attended. The chairman, Mr. D. F. Botwright (Publicity Department), expressed his pleasure that so many colleagues from the provinces were able to attend. Proposing the toast of the Association, Mr. J. R. Cheetham (manager, Export Department) congratulated the chairman and his committee on their work in creating the new branch.

Other speakers were Mr. A. G. N. Dixey, company secretary and vice-president of the Association; Mr. J. W. Ridgeway, director and vice-president of the Association; Mr. J. Kay (Brimsdown); Mr. A. E. Morris (Lamp Department); and Mr. H. Butterworth, managing director.

Mr. C. Rowbotham, M.I.E.E., manager of the Reigate District of the South Eastern Electricity Board, is retiring at the end of the year. Mr. Rowbotham is a Sheffield man and was educated at Sheffield University. After four years as a junior engineer at the Admiralty he became assistant electrical engineer to the Sheffield Coal Co. in 1923 and chief electrical engineer in 1925. He joined the Portsmouth Corporation as assistant electrical engineer in 1927 and in 1934 went to Reigate as assistant manager, becoming manager and engineer two years later. He held that position until nationalization when he was appointed district manager at Reigate. Mr. Rowbotham served as a fighter pilot in the 1914-18 war and with the Air Training Corps during the last war.

On 6th December over eighty long-service employees at the Stafford works of the **English Electric Co., Ltd.,** were presented with awards by the company. Under the chairmanship of Mr. J. R. Sully, general manager, Stafford, these employees, all with a minimum of forty years' service and some with as much as fifty-two years' service, were first addressed by Sir George H. Nelson, chairman and managing director. Sir George then called upon Mr. E. B. Banks, chief commercial manager, Mr. J. R. Sully, Mr. R. J. Sanders, commercial manager, Stafford, Mr. A. Reader, works manager, Stafford, and Mr. J. M. Ferguson, chief engineer, Stafford, to make the presentations.

Mr. Tom Fallon, formerly superintendent, Metropolitan Police, was the guest-speaker at the Christmas luncheon of the **Electrical Industries Club** at the Connaught Rooms, London, W.C.2, on Tuesday last. His amusing reminiscences, ending on a serious note, were very much appreciated by a large company of members and guests. Mr. A. B. Wildsmith was in the chair and a vote of thanks to Mr. Fallon was moved by Mr. H. St. J. de A. Donisthorpe.

OBITUARY

Mr. E. E. Sharp.—We regret to learn of the death at Cape Town, South Africa, of Mr. Ernest Edward Sharp, M.I.E.E., F.B.H.I., who was for many years associated with Venner Time Switches, Ltd. (now Venner, Ltd.). Mr. Sharp was educated at the South-West Polytechnic, Chelsea. After serving with Mather & Platt, Ltd., and the Chloride Electrical Storage Co. he joined Venner & Co., who were subsequently merged in Venner Time Switches, Ltd., of which he was one of the founders. He became managing director in 1939 and retired in 1943. In 1949 he and his wife (formerly Miss Veda Brice) went to live in South Africa. For a few years Mr. Sharp was a director of the Jackson Electric Stove Co., Ltd., and a founder of Tok Switches, Ltd. Mr. Sharp was chairman of the E.I.B.A. for six years and president in 1938. He had also been Master of the Worshipful Company of Clockmakers. He had served upon the Council of the I.E.E. and was a member of the Overseas Committee of the Institution.

Mr. R. H. M. Lea.—The death occurred on Sunday in Adelaide of Mr. Richard Henry McLure Lea, C.B.E., B.E., M.I.E.E., M.I.E.Aust., who had been chief engineer and general manager of the Electricity Trust of South Australia since 1947. Previously he was assistant manager of the former Adelaide Electric Supply Co. for ten years. He was fifty-six years of age. Mr. Lea was born in Scotland and educated at Larchfield School and Malvern College. During the 1914-18 war he served in the King's Royal Rifle Corps and afterwards went to Australia where he took his B.E. degree at Adelaide University. In the last war he served as a lieutenant-colonel in the A.I.F. in charge of the 4th Australian Army forward workshops. He leaves a widow, three sons and a daughter.

Mr. E. T. Hippisley, M.A., A.M.Inst.C.E., M.I.E.E., M.I.Mech.E., manager of the traction department (sales and engineering) at the British Thomson-Houston Co.'s head office at Rugby, died at Leamington on 9th December at the age of sixty-one. Throughout his professional life Mr. Hippisley devoted himself to electric traction, in which subject he was an acknowledged authority. Mr. Hippisley entered upon a three-year post-graduate apprenticeship with the British Thomson-Houston Company in 1920. He joined the staff of the traction department early in 1923, where for a time he specialized in the electrical design of traction motors. From 1929 Mr. Hippisley was responsible for heavy-traction contracts involving electric and diesel-electric locomotives, and he was appointed manager of the traction department in 1936.

The late Mr. E. T. Hippisley

Mr. Hippisley had lectured and written widely on electric traction, gaining a special premium for his paper on "Choice of Electric Traction-Motor Equipment," published in "I.E.E. Journal," 1935. He contributed to our special Railway Electrification issue on 21st May.

Mr. E. P. Lucking.—The death occurred on 9th December, at the age of sixty-four, of Mr. E. P. Lucking, M.I.E.E., manager of the London and district sales office of George Ellison, Ltd., from 1914 until his retirement in January of this year. He was also a director of Nathan & Allen, Ltd. Before joining George Ellison, Ltd., in 1912, Mr. Lucking served as development engineer of electric switchgear and motor starters with the Adams Manufacturing Co. (now Igranic Electric Co.) and the General Electric Co., Ltd., Witton. The funeral service took place at Esher Parish Church on Tuesday.

The late Mr. E. P. Lucking

Mr. J. T. Graham.—The death occurred on 4th December of Mr. J. T. Graham, O.B.E., A.R.T.C., M.I.Mech.E., part-time member of the East Midlands Electricity Board and vice-chairman of the North Midlands Regional Board for Industry. Born in 1890 and educated at the Royal Technical College, Glasgow, Mr. Graham served his apprenticeship with William Beardmore & Co. After holding appointments in Newcastle and Liverpool, he joined Worthington-Simpson, Ltd., Newark, with whom he remained for over thirty-five years, becoming general manager and assistant managing director. Mr. Graham was a member of the Council of the Institution of Mechanical Engineers and a past-president of the East Midlands Centre. He was also a governor of Newark County Technical College.

The late Mr. J. T. Graham

Mr. W. M. B. Furniss.—Gratitude is expressed by Mrs. F. J. Furniss and Mr. W. M. Furniss and family to the friends who by their generous donations have enabled them to send a cheque for £400 to the British Empire Cancer Campaign Fund in memory of the late Mr. W. M. B. Furniss.

PARLIAMENTARY NEWS

IN the House of Lords on 8th December Lord Crook, initiating a debate on accidents in the home, said that the Heating Appliances (Fireguards) Act came into operation on 1st October of this year. In due course it could be hoped that the compulsory application of fire guarding might save some preventable accidents. It would take a long time under existing legislation, because it had been pointed out that the Act did not apply to millions of unguarded electric, gas and oil heaters already in use in homes, offices, hospitals and other public buildings. There was also the constant sale of cheap electrical goods, or electrical parts, the insulation of which was not too good and the use of which was not always understood by the purchaser. There was the sale of things like a hair-dryer, without any accompanying warning that the use of the hair-dryer in a bathroom was a potential danger; and washing machines with electric roller wringers, without effective safety devices fitted to the rollers.

Lord Amulree said that the Fireguards Act was of some value in ensuring that electric, gas, and other fires would in future be sold with a proper guard. Most burns were caused by coal fires. The figures for fatal burns from coal fires were about 130, annually, whereas for electric fires the figure was 70, for gas fires 53 and for other fires about 58. That showed that the coal fire was still the main cause of trouble. Action should be taken to ensure that fireguards were used.

Another cause of trouble—it might be overcome by the Fireguards Act—was that in some new housing estates, the fire was a panel fire, either gas or electric, placed on the wall. There was no appearance of a guard around it, and it was difficult to notice where the fire was if there was not the usual mantelpiece or fender with it. He wondered whether the practice of installing fires in that way was still continued. It might easily be dealt with and stopped.

Lord Mancroft, Under-Secretary, Home Office, replying for the Government, said that the Heating Appliances (Fireguards) Act, 1952, prohibited the sale or letting on hire of certain kinds of gas or electric fires and oil heaters unless they were guarded up to prescribed standards. Regulations were made under the Act and there was a moratorium until 1st October this year for the sale of unguarded appliances made before 1st October, 1953. The Act was now fully in force but had not yet been in force long enough to show whether any material effect would result from it.

Television Suppressors

In the House of Commons Mr. Michael Stewart asked the Assistant Postmaster-General when he would make regulations concerning the fitting of television suppressors to electrical appliances.

Mr. Gammans, Assistant Postmaster-General, replied that it was hoped to lay regulations before Parliament early in the New Year.

Monopolies Commission

Mr. William Shepherd asked the President of the Board of Trade whether he would make a statement about further references to the Monopolies and Restrictive Practices Commission.

Mr. Peter Thorneycroft, President of the Board of Trade, said that a new reference was made to the Commission on 4th December. The subject referred to was the supply of electronic valves and cathode ray tubes.

Gale Damage

Mr. Donnelly asked the Assistant Postmaster-General, whether he is aware of the damage caused to the telephone system in Pembrokeshire by the recent gale; and what emergency steps he had taken to give assistance to the Post Office engineers in the area by drafting in temporary assistance from other Post Office areas that have not been affected so severely by the recent gale.

Mr. Gammans said that the recent severe and prolonged gales caused very considerable damage to telephone plant over a wide area. In Wales and the South West of England about 35,000 subscribers' lines were affected, and about 100 small exchanges were isolated for short periods. The number of subscribers affected in Pembrokeshire was about 1,300. Eighteen exchanges in the county were isolated and considerable damage was done to important cables carrying junction and trunk circuits. Many other areas were also affected so that it was not possible to draft in staff, but the repair work had progressed quickly.

E.C.A. Newcastle-on-Tyne Branch

AT the fifty-third annual dinner of the Electrical Contractors' Association (Newcastle-on-Tyne branch) at Newcastle on 10th December, the branch president, Mr. W. E. Johnson (Tynemouth) referred to probable developments in the electrical industry. He referred to air pollution and after stating that power stations increased this problem, he said it was a foregone conclusion that power stations would be using atomic energy instead of coal within a few years. If smokeless zones were established at Newcastle, there would be an excellent opportunity for the electrical industry to provide some of the space-heating equipment which would be needed. By then, the North Eastern Electricity Board would have its atomic power stations in operation and might be able to provide a special tariff.

Mr. Johnson dealt with experiments taking place in the transmission of power, and said it might be possible to produce transmission lines capable of handling 400 kV. He added that experiments taking place in Sweden with underwater cables opened up new fields, and might enable Britain to "export" power to European networks. Research work was also going on with a new chemical means of storing electricity.

Other speakers included Mr. A. F. Plummer, president of the Association; Mr. H. Esther, chief engineer, North Eastern Electricity Board; Mr. E. L. Histon, vice-chairman of the Newcastle branch of the E.C.A.; and the Deputy Lord Mayor of Newcastle (Councillor C. S. Carrick).

I.E.E. Benevolent Fund

AN appeal on behalf of the Benevolent Fund of the Institution of Electrical Engineers has been made to all members by Mr. J. Eccles, President of the I.E.E. He points out that last year the fund helped 123 persons and paid out the sum of £8,989. In addition the Homes Fund is providing comfort for elderly people in fourteen Homes at The Chesters. A sum of £8,000 is needed this year to reach the minimum of £50,000 on which this fund can work.

Next Week's Meetings

THE festive season curtails the programmes of meetings of electrical institutions and societies, most of which do not get under way again until the New Year. There are, however, three meetings on Tuesday next. At the Cadena Café, Cheltenham (6.30 p.m.), Mr. H. A. Turner is giving a paper on "Lighting of Parks and Gardens" before the Gloucester and Cheltenham Centre of the Illuminating Engineering Society. The speaker at the I.E.E. South-East Scotland Sub-Centre meeting at the Carlton Hotel, Edinburgh (7 p.m.) is Mr. J. W. Moule, whose subject will be "Floor Warming." At 2, Savoy Hill, London, W.C.2 (6.30 p.m.), Mr. J. C. Milne will talk on "Variable Speed Control of Motors," to the Association of Supervising Electrical Engineers.

INDUSTRY AND THE HOUSE

Higher Technological Education

By A. M. F. PALMER, A.M.I.E.E., M.P.

INTEREST in the House of Commons has now switched to pensions, but there was much of concern to industry discussed during the debate on the Queen's Speech.

Mr. Maudling, the able Economic Secretary to the Treasury, developed the Government's ideas on technological education. He said they had given particular study to the whole question and had received far-sighted advice from the Universities Grants Committee. Plans now proposed provided for a massive expansion of the Imperial College at South Kensington and major development at Glasgow, Manchester, Leeds and Birmingham, as well as progress at Cambridge, Sheffield and in Wales.

In the Government's view higher technological education had to be closely linked with other university studies. Mr. Maudling thought it was now increasingly realized on the Continent and in America that the traditional British view was right: men destined to hold positions of high responsibility in industry needed a broader education than could be given in institutions devoted entirely to technology or even to science. Industrial problems were often as much human as scientific; for that reason the humanities should always play a part in the training of industrial leaders.

At the time of the debate in the House of Commons Lord Glyn was also asking in the Lords if the Government had given consideration to the recommendations of the Parliamentary and Scientific Committee about the further development of higher technological education in Great Britain. Lord Glyn contended that Britain lagged behind almost every other country in facilities for developing broad technological knowledge. Lords Waverley and Cherwell supported him, Lord Cherwell going as far as to say that in spite of good intentions over the last three years little had been done. His Lordship went on to add that if advances in science were to be matched by increasing industrial efficiency, then Britain must have full-scale technological universities; these should enjoy "parity of esteem" with the older universities, which it would be impossible to achieve unless they were called universities.

Development of Existing Institutions

Replying to the debate Lord Salisbury, Lord President of the Council, stated that when he had first approached the idea of a technological university he had been immensely attracted by it. He had to admit now, however, that many of the foremost scientists in the country did not share that view. Whatever the merits, the proposal for a technological university was not an immediate practicable possibility; hence the Government had decided that the right policy in the foreseeable future was to build up and develop existing institutions. According to Lord Salisbury technical colleges are not to be excluded from the policy of expansion for higher technology. He said the Government recognized that regional colleges must meet increasing demands for high level training for those working in industry and for those requiring special courses. If the Government were to succeed they must ensure that in schools, technical colleges and universities, a high proportion of the cleverest young people should feel drawn to science and its practical application. It was necessary to divert to applied science and engineering some of the prestige and esteem which to-day was focused exclusively on pure science.

Debate on the Address

In the Commons the debate on the economic policy of the Government, reflected in the Queen's Speech, had been opened by the former Chancellor of the Exchequer, Mr. Gaitskell, moving an amendment "humbly regretting that the gracious speech displays an unwarrantable complacency towards the continued existence of social injustice and a doctrinaire determination to abandon public enterprise, essential controls and other forms of intervention by the community designed to check inflation, protect consumers and encourage economic expansion."

In one of the finest and most aggressive speeches Mr. Gaitskell has delivered for some time, he said the Government had made great play with the idea that early in their period of office they were engaged in a "salvage operation." There was no question of salvage and there had been no operation. True there had been an improvement in the country's economic position, but the sole reason was overwhelmingly the fall in import prices of 16 per cent since 1951, which had saved the country £500 million. Present-day prosperity was largely due to the efforts of the Labour Government to build up the export trade, which could not have been carried through without the much abused austerity programme. Had the Conservatives had their way in opposition, Britain would not be in her present fortunate position. He thought that a return to complete *laisser faire* economics was bad for production, for consumers, for fair distribution and dangerous for full employment. Concentrating his fire on dividends, Mr. Gaitskell stated that since the beginning of this year wages and prices had risen by about 1s in the pound, profits had risen twice as fast as wages at 2s in the pound; dividends had risen twice as fast as profits at 4s in the pound, while share values had risen by just under 40 per cent in the past ten months. Were the Government prepared to defend this, he asked, because if so they were increasing the difficulties for the most responsible trade union leaders? Demands for inflated wages were the Government's fault because they had allowed the whole dividend situation to get out of hand.

As is usual with debates on the Address, discussion ranged far and wide; from Sir Gurney Braithwaite demanding a more realistic loan policy of financing road construction to Mr. Coldrick, leader of the Co-operative Group in the House, asking for a Ministry of Consumers' Welfare. The debate had been started in serious style by both Mr. Gaitskell and Mr. Maudling—there is much first class economic material in their speeches, as will be seen from a close study of Hansard—but the end was far more of a knock-about parliamentary occasion. The gladiators were Messrs. Morrison and Crookshank; if these Right Honourable gentlemen added little to the clarification of economic issues, they should be forgiven for they vastly entertained the House. Mr. Morrison thought it not surprising that

the Government were complacent about social injustice; it was traditional in the Conservative mind. To this taunt Mr. Crookshank replied that if the words in the Opposition amendment "intervention by the community" meant intervention by the electors, then they had intervened all the way from Sunderland to West Derby. If, on the other hand, the Opposition meant that the Government had abolished intervention by Whitehall, then the more they did of that the better.

Perhaps it was as well that things ended with a bang and not a whimper. Members need a little something to cheer their humdrum lives these days.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

London Board Appointment

THE news that the London Electricity Board has again appointed a local government officer as secretary has shocked a great many people who are wondering why the Board has cold-shouldered its own industry for the second time.

There are plenty of men already in the supply industry with first-class qualifications and years of experience to their credit. If the London Board could not find these men, it did not look very far or very hard. What sort of future is there in electricity supply if this is the shape of things to come?

We have heard plenty about London being the No. 1 Board but on this occasion it seems to have forgotten it along with the loyalty it owes to its own industry and the men working in it.

E.W.

Electrical Engineers' Exhibition

MY Exhibition Organizing Committee has read with interest the leading article of your issue of 10th December, entitled "The Industry and the B.I.F.", and has noted particularly your appreciative reference to the continuing success of the A.S.E.E. Exhibition.

The Committee confirm their intention of carrying on the policy which so clearly meets with the full approval of all who support and visit the annual A.S.E.E. Exhibition: It is that of staging the best possible exhibition and attracting to it the greatest number of engineers and others directly concerned with the development and prosperity of the electrical industry, whether at home or overseas.

It is particularly encouraging to my Committee to have the full support of the leading organizations within the industry, including the British Electrical & Allied Manufacturers' Association, whose Council recently gave official recognition to the Exhibition.

*London, W.C.*1. P. A. THOROGOOD,
General Manager,
Electrical Engineers' (A.S.E.E.) Exhibition, Ltd.

Consumers' Deposits

MY letter regarding the deposit for which the London Electricity Board asked me gave briefly the gist of the telephone conversations. It was accurate, and entirely devoid of exaggeration. I know of no hints. The matter is one of interest and I see no objection to discussing it in the Press.

A large part of Mr. Warhurst's reply refers to the Board's policy of demanding deposits. I make no particular comment on this, though, as I said before, the telephone service manages very well without deposits against charges for calls.

It is true that I refused information: that was the names of people in the London Electricity Board who know me. I sought no preferential treatment, and still do not. It is also true that I was asked to write, and did not. That was because the invitation to write had a sting in its tail, which was to the effect that even if I did write, I should still have to pay the deposit. As I have said, I offered the fullest references and information regarding myself, and all was declined. I even offered to go and see them, and was told that it would not make any difference.

I would not like the point which I have raised to be hidden in a general discussion regarding deposits. My point is that I challenge the attitude of a section of the London Electricity Board who demand a deposit, and then, stubbornly and repeatedly, refuse to make the slightest investigation to see whether their demand is justified. Make no mistake: I was soundly belaboured with the big stick of monopoly and it was wielded to the battle-cry of "No deposit; no supply—and no arguments either."

*London, S.W.*10. LESLIE MAYNARD.

Manufacturers and Electricity Supply

A CALL for a National Electricity Consultative Council, with power to recommend direct to the Minister of Fuel and Power, is made by the National Union of Manufacturers in evidence submitted to the Committee of Inquiry into the Organization and Efficiency of the Electricity Supply Industry. The Union states that the cost incurred by the Central Authority in generating and transmitting electricity amounts to some two-thirds of Area Boards' total costs, but does not appear to be subject to review by consumer interests in any way. The effective control by Consultative Councils over Area Board expenditure is thus limited to something like one-third of the total. If there is to be effective consumer representation in respect of the cost of electricity to the consumer, it must also be exercised at the central point where the costs of generating and transmitting are incurred.

The National Consultative Council should represent industry, commerce, agriculture, labour and local authorities, and have power to make recommendations direct to the Minister. The Union also suggests that industrial representation on Consultative Councils and their district committees should be increased.

Electricity Boards should pay more attention to the needs of smaller factories, of which there are more than 42,000 employing between 11 and 100 people. An additional block tariff should be provided to remove anomalies caused where assessment is based either on floor area or installed capacity. The Union's general view is that Electricity Boards are progressive in outlook, but some of its branches think that the Boards are too impersonal, and that their officials are sometimes less approachable than the former corporation officials.

INDUSTRIAL NEWS

Australian Tariff Inquiry

The rate of duty on portable electric hand drills are to form the subject of an inquiry by the Australian Tariff Board. The machines concerned are classifiable under Tariff Items 176 (U) (2) and (3). Item 176 (U) (2) includes machines (other than those covered by Item 176 (U) (1)) having the mechanical driving units incorporated in the hand piece and designed for drilling, grinding, polishing or sanding, including motors imported for use with them, operating on frequencies not exceeding 60 c/s. Item 176 (U) (3) covers other types, including motors not exceeding 1 h.p. imported for use with them. At present the rates under 176 (U) (2) are 12½ per cent *ad valorem* under the British preferential tariff, 25 per cent under the most favoured nation tariff and 30 per cent under the general tariff; the respective rates under Item 176 (U) (3) are free, 12½ per cent and 12½ per cent.

Notification by United Kingdom trade associations or firms of intention to submit evidence is required by 30th December. Such firms should advise the Board of Trade, Commercial Relations and Export Department, Horse Guards Avenue, London, S.W.1, immediately, quoting reference number C.R.E. 13654/54.

British Radio for Peru

Equipment for a complete broadcasting station for Radio National de Peru is to be supplied by Redifon, Ltd. The station, which will be at Piura, is due to be opened next June.

Among the many items of equipment being provided by the company are a medium and a short-wave transmitter,s complete aerial systems; studio and control room units, and working and standby power plants.

All-Electric Kitchen

An attractive new all-electric kitchen has just been completed in the Queen's House showroom of the English Electric Co., Ltd., in Kingsway, London, W.C.2. The kitchen is 17ft long by 12ft wide with working surfaces and appliances arranged to give a preparation and cooking section, divided by a stainless steel sink unit from the home laundry section.

In the cooking section the recently introduced 3 cu ft refrigerator is displayed with the food mixer and automatic cooker. A revolving cupboard with two tiered shelves makes full use of corner space. At the left of the sink is the new tumbler dryer with the movable washing machine (with 3 kW immersion heater) alongside. All the appliances are in white enamel finish, a similar range in cream enamel finish being displayed in the demonstration kitchen adjoining the main showroom.

Educational

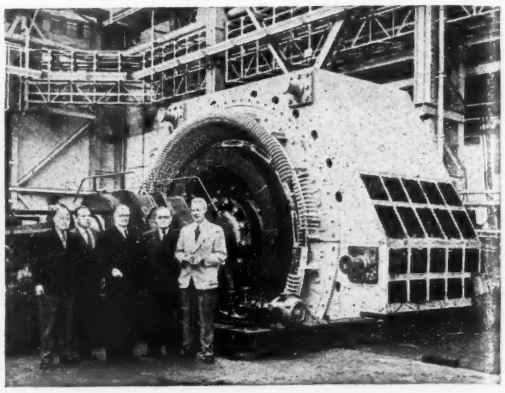
A leaflet giving particulars of post-graduate courses in science at the University of Liverpool is available from the Director of Extra-Mural Studies, 9, Abercromby Square, Liverpool, 7.

Two lecture courses on "Liquid Fuels, their Properties and Utilization" and "Recent Developments in Metal Finishing," and a laboratory course in refractory technology, commence after Christmas at the Northampton Polytechnic. Particulars can be obtained from Mr. J. E. Garside, head of the Department of Applied Chemistry at the Polytechnic, London, E.C.1.

Norwegian Visitors at Witton

Mr. Olav Fossen, chief engineer, Electricity Board of Norway, recently visited the Witton Engineering Works of the General Electric Co., Ltd., to see tests on a 62·5 MVA alternator which has been built there for the hydro-electric power station at Aura Kratfonlegg, Norway. He was accompanied by Mr. C. A. Christiansen, proprietor of A/S Elektrosalg, the Norwegian agents of the company.

The machine will be driven at 428·6 r.p.m. by an Escher Wyss Pelton wheel and generate at 12·3 kV, 0·85/0·95 power factor. It is designed for an overspeed of 780 r.p.m. for one minute and 640 r.p.m. for 10 to 15 min, and will be one of the largest hydro-electric generators of the horizontal shaft type in Europe. Its total weight is over 310 tons, the magnet wheel alone accounting for 175 tons. Because of transport difficulties the machine is specially constructed so that it can be dismantled and shipped in sections weighing not more than 55 tons each for re-erection on site.



G.E.C. 62·5 MVA hydro-alternator for Aura Kraftonlegg, Norway. Standing beside the set are (left to right): Messrs. I. James, production manager, Witton Works; C. A. Christiansen, proprietor of A/S Elektrosalg; J. F. Prince, deputy sales manager (export), Witton Works; Olav Fossen, chief engineer, Electricity Board of Norway; and J. W. Laing, chief engineer, Witton Works

Bitumen Company's Jubilee

Dussek Bitumen & Taroleum, Ltd., recently celebrated its fiftieth birthday, and to commemorate the event it has issued a booklet outlining its history.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £156 0s 0d
COPPER, H.C. Electro	ton £282 10s 0d
Fire Refined 99·70%	ton £281 0s 0d
Fire Refined 99·50%	ton £280 0s 0d
COPPER Tubes ..	lb 2s 9d
Sheet	ton £347 5s 0d
H.C. wire and strip ..	ton £320 10s 0d
LEAD, English ..	ton £103 10s 0d
Foreign	ton £102 0s 0d
MERCURY	flask £110 0s 0d
TIN, block (English) ..	ton £712 0s 0d
ZINC, G.O.B. Foreign	ton £83 5s 0d
Electrolytic	ton £86 17s 6d
BRASS Tubes (solid drawn)	lb 2s 2½d
Sheet	ton £277 5s 0d
Wire	lb 2s 9½d
PHOSPHOR BRONZE Wire	lb 4s 2½d
PLATINUM	oz £30 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 24¾d-24¾d

All-electric kitchen opened at the English Electric showrooms in Kingsway, London

Control of Strategic Goods

The Board of Trade has made the Strategic Goods (Control) Order, 1954 (S.I. 1954 No. 1622, H.M. Stationery Office, price 9d), to take effect from 7th January. This supplements existing restrictions by extending them to goods which do not originate in or pass through the United Kingdom. The Order prohibits the disposal of a wide range of materials, machinery and equipment, except under licence, to Russia, Russian-controlled countries and China.

Included in the list are the following:—Generators, generating sets and synchronous condensers of a rating of 10,000 kW (m.c.r.) and over and stators and rotors for these; motors of 12,500 b.h.p. (one-hour rating) and over; motors of over 1,000 b.h.p. (one-hour rating) and over, reversing type, liquid cooled and totally enclosed; and automatic and semi-automatic apparatus for starting, stopping, reversing and speed control of motors of 12,500 b.h.p. and over.

Many types of communication and electronic instruments and apparatus are also covered by the Order. Inquiries about the Order should be addressed to the Export Licensing Branch, Board of Trade, Holborn Viaduct, London, E.C.1 (telephone: City 5733).

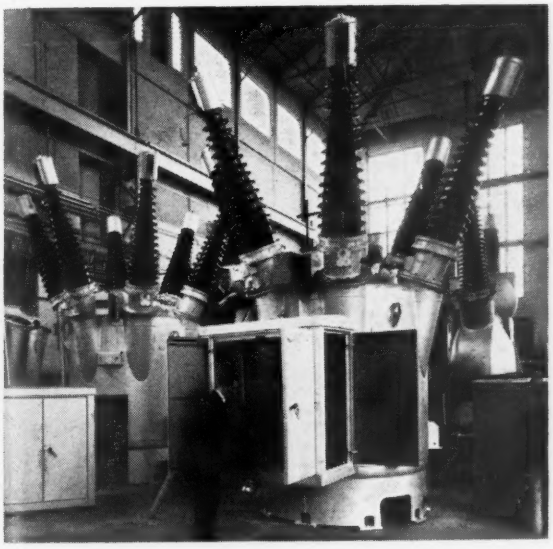
Monopolies Commission

As announced in a written answer in Parliament on 8th December the Board of Trade has referred the supply of electronic valves and cathode ray tubes, to the Monopolies and Restrictive Practices Commission, which is to report about both the facts of the matter and their bearing on the public interest. Any person or organization wishing to offer evidence should write to the secretary of the Commission, 3, Cornwall Terrace, Regent's Park, London, N.W.1.

Large Oil Circuit Breakers

The accompanying illustration shows a number of 132 kV, 1,500 MVA "Shuntarc" circuit breakers having all three phases in one tank, in course of manufacture at the Willesden works of the British Thomson-Houston Co., Ltd. These oil circuit breakers are being supplied to the North of Scotland Hydro-Electric Board for installation at Brechin. This installation will be the first in Great Britain to employ 132 kV oil circuit breakers having all three phases housed in a single tank, and it will be apparent that this construction has many advantages as regards installation and maintenance. Some of the units shown in the illustration have now been despatched.

B.T.H. 132 kV, 1,500 MVA oil circuit breakers with the three phases in one tank



Cooker Handling Simplified

New 7-ton Bedford vehicles specially equipped with hanging shelves and hydraulic tailboards have been acquired by Tricity Cookers, Ltd., to facilitate the safe handling of products, in particular the "Queen" auto-controlled cooker. The method employed in loading is to place three cookers side-by-side on a special shelf on the tailboard at ground level which is then hydraulically lifted to the upper deck. Eight of these operations load twenty-four cookers into the upper part of the vehicle and a further twenty-four are then loaded on to the lower deck. Special hessian mattresses are used to keep each cooker from touching its neighbour or the side of the vehicle.

A specially constructed vehicle for transporting "Tricity" cookers

Selling Cookers in Scotland

A house-to-house campaign was held recently in Perth by the North of Scotland Hydro-Electric Board to sell electric cookers. Salesman called on thousands of housewives, both consumers and potential consumers and not only sold cookers but also a wide range of domestic electrical appliances. At a concert and demonstration at the culmination of the campaign, Mr. G. R. McIntosh, a member of the Board, said that four years ago the Town Council and the Board devised a method of giving freedom of choice to tenants, either gas or electric. As new houses became available, the Town Council gave the Hydro-Electric Board and the Gas Board the names of the new tenants. During the first year of the scheme 8 per cent of the tenants chose electricity. Since then there had been a steady rise in the demand for electric cookers, and during the last nine months of 1954 nearly 60 per cent of new tenants had chosen electric cookers. Co-operating with the Hydro-Electric Board in the sales campaign were the General Electric Co., Ltd., the Revo Electric Co., Ltd., British National Electrics, Ltd., the Simplex Electric Co., Ltd., the Jackson Electric Stove Co., Ltd., and English Electric Co., Ltd. Exhibitions and demonstrations were held in five halls during the week.

Co-operative Electrical Retailing

The Co-operative movement in Scotland is setting out on a programme of specialization, replacing the older policy of handling goods in larger general units. Creation of specialized electrical appliance shops is a move in this direction and has been adopted by a large number of Co-operative Societies. Within the past few weeks a number of new electrical shops have been opened and more are pending. The latest is that at Wishaw where two shops have been converted into one electrical department handling appliances, electrical equipment, domestic equipment, radio and television. One shop is used for display purposes and the other is devoted to repair and maintenance. The Clydebank Co-operative Society also opened a specialist shop recently which is devoted to radio and television.

New E.A.W. Branch

A branch of the Electrical Association for Women has been formed in Beverley, Yorks., under the presidency of the Mayoress, Mrs. G. Scruton. The chairman is Mrs. D. E. Wright, the hon. secretary, Mrs. E. Welpton, and the hon. treasurer, Mrs. L. Johnson.

Whitaker's Almanack

The 1955 edition of "Whitaker's Almanack" is the same length as last year's edition, which was the largest ever published. The sixteen-page illustration section, depicting notable events, introduced last year, portrays some of the scenes of the Queen's tour of the Commonwealth, with photographs of other events and personalities of the year. The section on local government in the United Kingdom has been expanded by a new article covering the constitution and the election of councils, organization and finance, and the statistical and other sections have been

brought up-to-date. There are the usual three editions (complete edition, 1,190 pages, cloth boards, 15s; the shorter edition, 694 pages, paper bound, 7s 6d; and the library edition, leather bound with coloured maps, 30s). These are obtainable from J. Whitaker & Son, Ltd., 13, Bedford Square, London, W.C.1.

James Howden & Co.'s Centenary

The current number of "Howden's Quarterly" the magazine of James Howden & Co., Ltd., celebrates the company's centenary year. As a frontispiece there is a portrait of the founder James Howden (1832–1913) and the first article is a biographical sketch. There is much interest in an illustrated account of Glasgow a hundred years ago. Other articles cover "Fifty Years of Turbine Construction," boiler fans at Uskmouth power station and various other aspects of the company's work.

Drivers' Handbook

The Traders' Road Transport Association has issued a revised edition of the "Driver's Handbook for C Licence-Holders." The handbook, written by Mr. R. E. G. Brown, secretary of the Association's London and Home Counties Division, is published at 1s a copy. The new edition has been brought up-to-date in respect of the lighting regulations and speed limits for empty light goods vehicles, as well as in other matters. It provides 40 pages of concise information in non-technical language on the law and drivers' hours, records, licences, offences, penalties, maintenance of vehicle, loading, speed limits, tyres, general driving hints and road safety.

Copies are available at the Association's Divisional Offices throughout the country.

Grid Suspension Wiring Installation

Troughton & Young, Ltd., have recently completed an interesting general lighting installation, using the Enfield grid suspension wiring system, at Humphreys Joinery Works, New Malden, Surrey. The supply is taken from the London Electricity Board's 400/230 V three-phase four wire service terminals and the lighting installation is balanced over the three phases of the supply system. The circuit wiring to the lighting outlet points was carried out using 7/0·029in v.r.i. 4-core Enfield grid suspension cable to supply a total of some ninety 200 W tungsten lighting points. Each point is fitted with a standard industrial enamelled metal dispersive reflector and switch controls are conveniently arranged at the termination of the grid suspension cable runs. The whole of the circuit wiring and equipping of the new lighting installation was carried out during normal working hours without interference to the normal production in the joinery works.

Enfield grid suspension wiring system installation in Humphreys Joinery Works, New Malden

Productivity Exhibition

"Working for Better Living" was the theme of a productivity exhibition opened by Sir Thomas Hutton at the Woolwich Polytechnic on Monday last. The exhibition was organized by the British Productivity Council in conjunction with Woolwich Polytechnic and a number of large industrial concerns took advantage of this opportunity to show how production efficiency has been increased within their respective organizations. Siemens Brothers & Co., Ltd., represented local industry on a large stand devoted to the better uses of manpower, plant and processes in a large electrical works.

The time-saving section of the Siemens stand included improved testing devices exclusively developed in the company's works. A demonstration which aroused particular interest was a "magnetic floater" which automatically separates metal plates or strips so that a press operator can pick them up without fumbling and wasting time and labour. Another exhibit devised in the works consisted of a pair of pliers capable of performing three jobs previously requiring three separate tools. Various machines were operated on the stand to illustrate how engineering ingenuity can improve efficiency.

Mains Frequency Induction Furnace

Following an order for four arc melting furnaces, valued at £115,000, the Tata Locomotive & Engineering Co., Ltd., of India has commissioned a mains frequency coreless induction melting, superheating and holding furnace from the same supplier, Birlec, Ltd. This 5-ton capacity unit will be installed in the same foundry as the four arc furnaces. It will have a melting rate at 8 cwt/hr or a superheating rate of 100 deg C of 6 tons/hr, while automatic power reduction equipment will be incorporated for strictly holding duties.

Flexibility of foundry operation will be the most important advantage obtained from these five furnaces. They will be able to produce steel castings of 20 tons and over, small steel castings in a fully mechanized foundry, and grey iron or alloy iron castings in a fully mechanized foundry. The induction furnace can also be used for the production of alloy irons and the economical reclamation of scrap cast iron borings.

Large Scottish Cable Contract

A contract valued at over £800,000 has been placed by the South West Scotland Electricity Board with Scottish Cables, Ltd., Renfrew, for the supply of paper insulated cables during the year commencing 1st April next.

Changes of Name

Stand, Ltd., has changed its name to Aluminium (Canada), Ltd.

Associated Technical Manufacturers, Ltd., has changed its name to Permanoid, Ltd.

Tiltman Langley Laboratories, Ltd., has changed its name to Tiltman Langley, Ltd.

R.T.S. Electronics, Ltd., is now Simon Sound Service, Ltd.

Trade Announcements

The address of the Middlesbrough district office of **British Insulated Callender's Construction Co., Ltd.,** is now 55–57, Borough Road, Middlesbrough (telephone: 43644).

The **Stonebridge Electrical Co., Ltd.,** has been appointed agent for Trüb Täuber & Co., Zurich, who specialize in oscillographs, electron microscopes, diffractographs, heat meters and switchboard indicating and recording instruments.

The office and works of **J. H. Hayman (Electrical Engineers), Ltd.,** are now at Fresh Wharf, Highbridge Road, Barking, Essex (telephone: Rippleway 2274/5).

Catalogues and Lists

ALARMS AND SIGNALS.—Leaflet describing the "Bridisco" low voltage alarm mat.—B.D.C., 591, Green Lanes, London, N.8.

FANS.—16-page catalogue on axial flow fans.—STURTEVANT ENGINEERING CO., LTD., Cannon Street, London, E.C.4.

FURNACES AND KILNS.—Illustrated priced catalogue of "Webcot" electric furnaces and kilns.—BERNARD W. E. WEBBER, Lower Street, Newcastle, Staffs.

GENERATORS. — Illustrated publication describing three types of mobile generating sets (DE/190).—ENGLISH ELECTRIC CO., LTD., Diesel Division, Brownsover Hall, Rugby.

INSTRUMENTS.—Catalogue illustrating and describing the range of "Pullin" industrial switchboard instruments.—MEASURING INSTRUMENTS (PULLIN), LTD., Winchester Street, London, W.3.

HEALTH LAMPS.—Illustrated folder of health lamps for ultra-violet and infra-red treatment, together with prices (300).—LUMSDEN LAMP CO., Millburn, Almondbank, Perth.

LAWNMOWERS.—Leaflet illustrating the company's range of new season electric lawnmowers.—H. C. WEBB & CO., LTD., Tame Road, Witton, Birmingham, 6.

LIGHTING FITTINGS.—16-page illustrated priced catalogue of "Quick-Lock" fluorescent trough reflectors.—VERITYS, LTD., 65, New Street, Birmingham, 2.

Pocket book of "Hi-Craft" fluorescent lighting, together with priced leaflets and a broadsheet. — SMART & BROWN (ENGINEERS), 8, Rose & Crown Yard, St. James's, London, S.W.1.

RELAYS.—Technical leaflet on the new "Elremco" type MIR relay for a.c. and d.c. operation.—ELECTRICAL REMOTE CONTROL CO., LTD., Eastern Industrial Estate, Harlow New Town, Essex.

Meter Assembly

MODERN METHODS AT SMITH'S DUNBLANE FACTORY

PRODUCTION at the new Kinbuck Works of Smith Meters, Ltd., at Dunblane, Perthshire, is now well into its stride. Acquired in 1950, the factory, which was originally a textile mill with a history dating back over 200 years and more recently an engineering works, was first utilized as stores and later as a testing station. Assembly work was commenced towards the end of 1952 and the premises were officially opened last year by the Rt. Hon. Thomas Johnston, C.H., P.C., chairman of the North of Scotland Hydro-Electric Board. To-day employment is provided for about seventy locally trained men and women and this number will be doubled as plans for the expansion of manufacture of components mature.

At present production is concentrated entirely on one type of meter, a single-phase house service credit unit with a maximum continuous rating of 40 A, though the testing of prepayment types is also carried out. Initially for a short period the company's AR type instrument was made but with the development of the magnetic material "Alcomax II" there was a change-over to the new AM type meter with its anisotropic magnet braking system. The new instrument has a slightly different method of quadrature adjustment from the AR type, both coarse and fine adjustment being made possible by varying the inductance rather than the resistance of the coils.

The Bakelite mouldings for both the bases and the covers are made on the premises and an interesting development which is quickly finding favour is the use of white moulding material instead of black. Apart from the attractive appearance, this innovation has the practical advantage that being translucent the moulding greatly facilitates adjustment of the mechanism.

Screwing the meter elements to the bases

In the first assembly operation the series and potential coils are fitted to the element laminations received from the company's main factory at Streatham. The series coils are wound at Dunblane but arrangements have not yet been completed for making the potential coils there. Tags are then soldered on to the potential leads and the back plate and packing pieces are added.

After the front plate has been assembled on to the elements the quadrature insulators are fitted. Tinning and shaping of the series coil leads is followed by the application of a coat of varnish, the coils being heated to enable the varnish to penetrate the silk tape. Lugs are attached to the series coil leads and are held in position by jigs and soldered. The leads are then taped and varnished again and the soldering is inspected. An electric oven constructed by Smith's own engineers is employed to harden the varnish, this process taking about two hours.

After fitting on the adjustable deflectors, the front chassis, diecast at Streatham in one operation with a dozen holes half of which are tapped, is attached by six clamping screws. At this stage the units are inspected, the lamination gaps are squared off and all nuts are tightened. The overload assembly is held in place by a spring clip. The light load adjustment, a negative vane moving across the potential coil, is then fitted followed by the quadrature loop formed in a sub-assembly section where other components, such as overload glass covers, are dealt with. The quadrature loop incidentally incorporates a temperature compensator. At another inspection point the potential coil is checked for continuity. A final tightening of screws completes the element assembly.

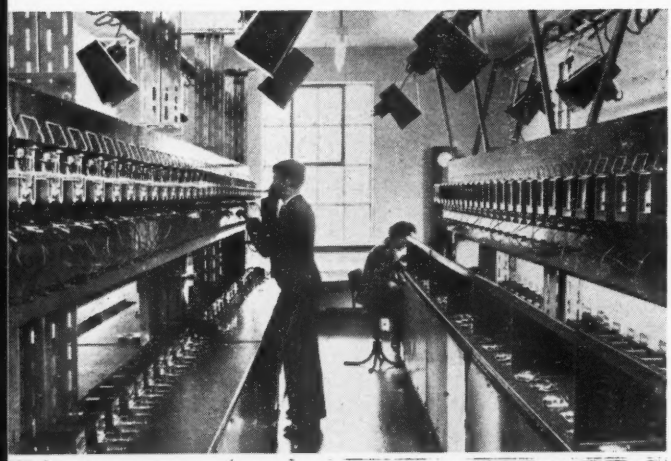
The main assembly department

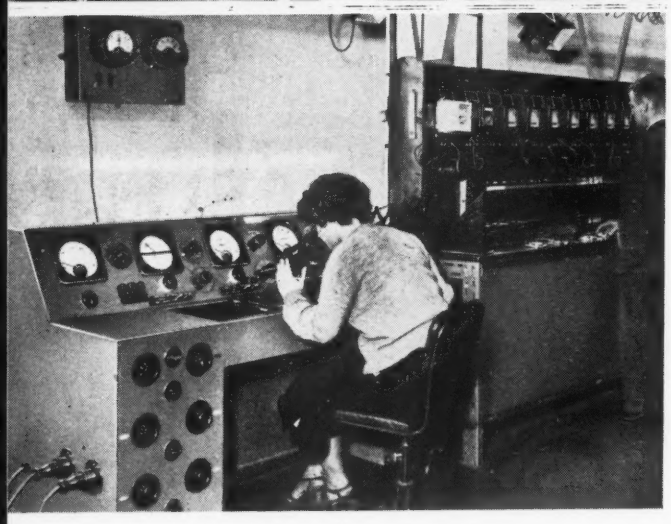
The fitting of the terminal blocks to the base starts the operations on the meter assembly line. The cover stems are then set in the base to a predetermined length and the element is assembled to the base. The potential and current leads are secured to the terminal blocks and the top of the rotor bracket is checked for alignment. The top bearing is inserted and the rotor is set centrally in the back gap of the element, the magnets then being screwed on to the chassis arms. Any dust that may have been picked up is removed by air blowers. In the final inspection the series and current coil leads to the terminal block are checked for tightness and the index or dial, which may be of either the train or direct reading (cyclometer) type, is fitted.

Belt conveyors are employed throughout assembly and a further aid to production is the adoption of a system whereby operators can call for work or components by pressing buttons which illuminate indicator lamps on a central board.

In the test department the rotors are first trued by hand with the aid of stop watches and then checked on a check meter to fine limits. Apart from the sub-standard meter and the apparatus for securing a constant electricity supply at any desired voltage, the equipment of the test room includes apparatus for washing jewels and inspecting them under an illuminated magnifying glass.

The top illustration shows meters being regulated and tested and the lower one the control panel in the test room





Light-current Developments

IN the first of three papers presented before the Institution of Electrical Engineers on 14th December, Mr. G. W. Bowdler (National Physical Laboratory) gave details of the design and performance of an attracted-disc voltmeter capable of measuring the effective value of sinusoidal voltages ranging from 30 to 50 kV (r.m.s.) within 0·1 per cent and below 30 kV within 1·0 per cent. The instrument is filled with nitrogen at 150 lb/sq in or nitrogen mixed with Arcton 6 (dichlor-difluor-methane) at 50 lb/sq in. Accuracy is highest at large spacings of electrodes and high electric stresses between them and falls off quickly as these stresses, and hence the attractive force acting on the disc, are reduced. Clearances between the electrodes have been designed to withstand voltages up to 700 kV (peak), but measurements have been limited to 350 kV by the insulator supporting the high-voltage electrode. For routine measurements the electrode spacing can be adjusted until the electrostatic force on the disc balances a fixed weight so chosen that the micrometer scale can be read directly in kilowatts.

The second paper by M. E. Haine and M. W. Jervis (Associated Electrical Industries) described a new method of stabilizing a 50 kV d.c. voltage source by means of an electron velocity analyser to measure changes in voltage. A requirement in an experimental attempt to achieve a resolving power of atomic dimensions with an electron microscope is a power supply stable within 2 to 3 parts in 10^6 over time intervals up to 10 min. Longer intervals could probably be achieved, but further experimental work is considered necessary to locate the causes of residual draft. A degenerative feed-back circuit, including parallel d.c. and a.c. amplifiers, is employed.

Mr. Jervis was also the author of the third paper, which dealt with means of delivering 50 to 150 mA stable within 4 parts in 10^6 up to one hour for the magnetic deflecting field of the stabilizer and the magnetic objective lens of the electron microscope. The output current is required to be variable in steps of not less than one part over a range of 10 per cent. The degenerative feed-back system is used with a contact-modulator amplifier, self-oscillation being prevented and the frequency response improved by an auxiliary a.c. feed-back loop.

Electronic Instrument Maintenance

OPENING a discussion in the Measurements Section of the Institution of Electrical Engineers on the servicing of electronic measurement instruments and its effect on their design, Dr. Denis Taylor referred to experience of the Atomic Energy Project. There, he said, the fault rates of scalers, counting-rate meters, amplifiers and stabilized power supplies had yearly fault rates of 0·5 to 1·5 per annum, according to type, which might give, with elaborate assemblies, seriously short operating periods at critical times and introduce hazards.

Thermionic valves accounted for 70 per cent of all failures, rectifier tubes being the worst offenders with fault rates of 6 per cent. Selenium rectifiers were therefore used, the average for these being only 0·4 per cent per annum. The figure for vesconol and nitrogol capacitors had been reduced in the past year to a satisfactorily small fraction of 1 per cent. High stability resistors were less satisfactory with 0·7 per cent (compared with 0·02 for Atomic Energy of Canada, Ltd., whose resistors were derated by 50 per cent). Cold-cathode tubes at the Atomic Energy Research Establishment had good reliability and had replaced hot valves for some applications.

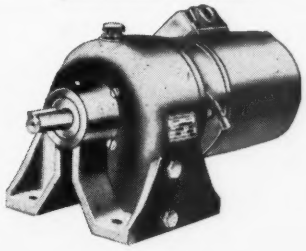
Most laboratory instruments were now being designed for self-testing. The more elaborate types had marginal testing facilities to prevent failure due to slow drifts in their characteristics. Mention was made of a prediction test unit, details of which were recently published by the U.S.A. Bureau of Standards, for indicating deterioration below safe levels.

NEW ELECTRICAL EQUIPMENT

Geared Motors and Speed Reducers

Two additional types of foot mounting and flange mounting f.h.p. geared motors and speed reducers have been added to the standard range of larger industrial units made by ELECTROPOWER GEARS, LTD., Kingsbury Works, Kingsbury Road, London, N.W.9. Known as types ESR50 and ESRV50, these units have a maximum torque at 12 r.p.m. of 24·6 lb-ft. In certain cases lower speeds are obtainable and the units are also available as a two-speed geared motor. The maximum standard ratio is 116·8 : 1; the minimum is 2·56 : 1. The gear wheels, pinions and shaft are made from high tensile steel. The output shaft is fitted with ball bearings, while the first gear, second pinions and intermediate gear and final pinion revolve on fixed steel layshafts, the pinion being fitted with phosphor bronze bushes. Splash lubrication is provided. These units can be supplied for mounting in practically any position.

Electropower Gears horizontal mounting speed reducer with motor



Low Frequency Transformers

A range of hermetically sealed transformers for operation at frequencies as low as 2 c/s is offered by AVIS & BAGGS, Ltd., 11–13, Gosbrook Road, Caversham, Reading, Berks. There are both input and output types with balanced windings, internal screens and a heavy mumetal outer case to reduce stray pick-up to a very low level. Intended for geophysical and similar applications, typical performance figures for an output transformer show a primary inductance of 3,600 H measured with an input of 1 V at 10 c/s in a space of 20 cu in; the weight is 2 lb. All units have "Corundite" insulators, are vacuum impregnated and completely sealed.

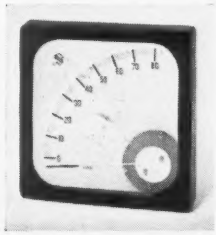
A 1,000 H tapped filter choke with a Q of 10 at 50 c/s and a weight of 7½ oz is also available.

Dry Bearings

A range of bearings is now available from the GLACIER METAL CO., LTD., Alperton, Wembley, Middlesex, for use where lubrication is either not possible, undesirable because of the nature of the process involved, or is not an easy matter to carry out. Essentially, these dry bearings consist of a steel backing lined in strip form with porous bronze impregnated with p.t.f.e. to the full depth of the porous bronze layer, leaving on the surface a continuous film of the plastic. The composite strip is pressed into butt jointed wrapped bushes identical in form to the company's standard wrapped bushes. Thrust washers are also made from this material in standard sizes. The strip can be supplied as flats for use on machine tool slides, etc. Although these are essentially dry bearings, accidental lubrication will not affect their operation; in fact, the load bearing qualities will be improved.

Space Saving Meter

The latest addition to the range of instruments made by MEASURING INSTRUMENTS (PULLIN), LTD., Eastern Works, Winchester Street, Acton, London, W.3, is the quadrant meter which is ideal for use where a long scale instrument is required on equipment having limited interior space available. Although it occupies the same space behind the panel as a conventional meter with a 2in scale and has a front projection of less than an inch, it has a scale length of 7in.



Pullin quadrant meter

The movement is fitted with a spear shaped pointer travelling over a 90 deg arc and is totally enclosed in an aluminium case. The dial, which can be supplied in various colours, is made of translucent material and is unbacked. This, together with the positioning of the movement in the corner of the dial facilitates illumination from the rear and results in a uniform spread of light over the whole scale.

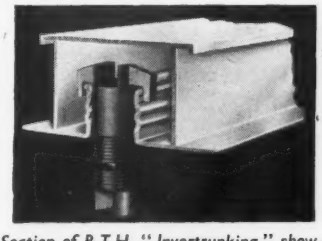
The meter is available as a milliammeter or ammeter, with any range from one milliamp upwards, or as a voltmeter and it can be supplied with a moving coil movement for d.c. circuits or incorporating a rectifier for a.c. measurements.

Inverted Trunking

A new form of inverted trunking or conduiting, carrying wiring and cables, lighting and other electrical fittings, which may be simply attached by means of T-bolts, has recently been introduced by the BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, London, W.C.2.

"Invertrunking," which measures 4in wide by 1 1/16 in deep, consists basically of a one-piece aluminium extrusion, which is joined by a channel section where necessary. A spring steel cover fillet completes the section when all wiring is in position; similarly, it is only necessary to remove this when alterations to the circuits or fittings are desired. Angle, tee and cross-over sections are available to order. It offers a wide range of flexibility, may be mounted flush on to beams or structural ceilings, or cast *in situ* (when a protective coat of bituminous paint is necessary), and it can also be used with plaster. The trunking has been designed with the suspended ceiling in mind and the broad flanges support standard forms of ceiling tiles.

Circuit wiring may be inserted after the ceiling is completed and the use of the new type of B.T.H. "Parablock" connector block at intervals in the main wiring allows lighting layouts to be simply and quickly altered. The price is 4s 3d per ft.



Section of B.T.H. "Invertrunking" showing a T-bolt used to suspend lighting and other fittings

Electric Blankets

Two new models of electrically heated blankets have been announced by THERMOSET APPLIANCES, LTD., Chapel Works, Failsworth, Manchester. The first, known as the Thermoset "Super," is made from pure wool with a taffeta bound edge and measures 60in by 30in. The loading is 105 W at 230 V. It is supplied with 9ft of ivory coloured flex which incorporates a matching on-off switch. The second model, the "Cozee," measures 60in by 28in and is manufactured from Duplex material. The fitting of an on-off switch is optional. Both models are claimed not to interfere with radio or television reception. The price of the "Super" is £6 10s 1d, including purchase tax, and the "Cozee" retails at £4 2s 9d or £4 8s 9d with switch.

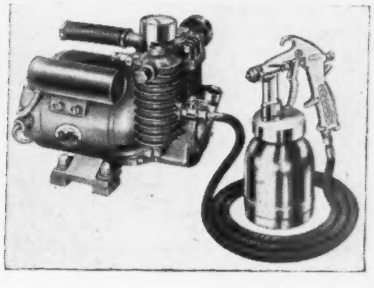
Spraying Plant

The latest addition to the range of spray painting equipment announced by B.E.N. PATENTS, LTD., High Wycombe, Bucks, is a lightweight portable set which can be carried in one hand. This "Handispray" outfit is designed for use where the volume of work does not warrant larger equipment. There are three interchangeable nozzles.

The unit consists of a 2·58 cu ft/min single-cylinder air-cooled compressor flange mounted and direct coupled to a ½ h.p. electric motor. The motor is protected against overloading by a special "Thermotrip" cut-out. The normal voltage ranges are 200/220 and 230/250, single-phase, 50 c/s.

A 15ft length of 3-core c.t.s. cable is provided and a similar length of air hose with unions is also available. The total weight is 45 lb and the price, complete with spray gun and hose, is £37 6s 6d.

B.N.E. "Handispray" outfit



Financial Section

STOCKS and SHARES

THERE was little indication, at the beginning of this week, of any very positive reversal of the dull tendency established in Stock Exchange markets a fortnight or so ago. Uncertain behaviour on the part of gilt-edged securities affected most other high-grade investments, including the leading industrial ordinary shares. It was ascribed largely to continued discussion over the possibility of an upward change in Bank Rate. This was added to seasonal factors which normally make their influence felt towards the end of the year, and which include selling of securities for purposes of tax payments, personal expenses and "window-dressing."

Interest Rates

Talk of higher Bank Rate, which is held responsible for much of the present market uncertainty, accompanies expressions of anxiety about a reappearance of inflationary symptoms in the economy. These are apparently discovered in the very full employment figures, in the evidence of raw material shortages here and there, in the banking returns and in the sterling exchange rate. Some advocates recommend that the introduction now of a mild measure of dearer money might stop a need for something more drastic later on.

Price Changes

Losses of about 1s 3d in G.E.C., and 2s 6d in English Electric shares are fairly representative of the week's trend in the upper strata of the industrial market. B.I.C.C., on which the interim dividend is being kept unchanged, were also 2s 6d lower. Quotations to decline 1s or more included, among others, those for Babcocks, Aron Meters, Chloride Electrical, Southern Areas and Johnson & Phillips. Resistance was displayed by Desoutters and Telegraph Condenser (on both of which the interims for the current year have been raised), also by Falk Stadelmanns and S. Smith. Peto Scotts changed hands around 1s 4½d after the company's announcement. British Electricity stocks were all marked down.

Aberdare Cables

Financial year of Aberdare Cables (Holdings) finished last October. The interim dividend on account of that period was raised from 5 to 7½ per cent. Last time the final distribution, also of 7½ per cent, was declared in April. Meanwhile the company says that, on the information at present available, the steady rise in the profits of the group during recent years has been continued in the latest period. This information is included in an announcement by the holding company in connection with an offer to acquire outside shareholdings in the South Wales Switchgear and Aberdare Engineering companies, in exchange for its own shares. The date

The Week's Price Changes

Company or Board	Nom. Value	Middle price 13th Dec.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1954 Highest	1954 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	95½	−½	3	3	3 2 10	97	88⅞
Brit. Elec. 1974/77	100	95	−½	3	3	3 3 2	96½	87½
Brit. Elec. 1976/79	100	99½	−1	3½	3½	3 10 4	101½	93⅝
Brit. Elec. 1974/79	100	109	−1	4¼	4¼	3 18 0	111½	103⅛
Overseas Electric Supply								
Calcutta Elec.	£1	22/6		6†	6†	5 6 8†	24/6	18/7
East African Power	£1	23/-	+6d	7	7	6 1 9	23/4	19/6
Nigerian Elec.	£1	24/-		10	10	8 6 8	25/-	23/6
Palestine Elec. "A"	£1	21/-		Nil	Nil	—	21/-	16/-
Perak Hydro-Elec.	£1	18/6	+6d	6	10	10 16 2	20/-	13/9
Equipment and Manufacturing								
Aberdare Cables	5/-	13/3	+3d	25	12½*	4 14 3	14/3	8/1
Aerialite	1/-	12/-	−3d	88⅛	88⅛	7 7 2	14/6	10/9
Allen, W. H.	£1	78/3		15	20	5 2 3	78/6	50/-
Aron Elec. Ord.	£1	56/6	−3/6	20	15	5 6 4	60/-	43/-
Assoc. Elec. Ord.	£1	60/-	−9d	20	11½*	3 14 6	62/6	41/6
Automatic Tel. & El.	£1	70/-		15	15	—	73/-	57/3
Babcock & Wilcox	£1	70/-	−3/3	18	12*	3 8 7	76/3	47/3
Baldwin, H. J.	2/-	5/-	+3d	20	20	8 0 0	5/6	3/9
Bakelite	10/-	28/3	−1/9	12½	12½	4 8 6	32/-	23/6
British Aluminium	£1	38/9		12	10	5 3 1	40/-	33/9
B.I. Callender's	£1	46/3	−2/6	10	10	4 6 9	52/-	37/9
B.I. Callender's 6% Pref.	£1	26/3		6	6	4 11 6	26/6	24/3
British Thermostat	5/-	26/3		35	27½*	—	28/-	12/-
British Vac. Cleaner	5/-	14/3	+6d	15	25	8 15 6	14/6	11/6
Brook Motors	10/-	42/6	−1/3	20	20*	—	45/6	29/3
Brush Ord.	5/-	7/6	−3d	4	6	4 0 0	8/3	3/6
Bulgin, A. F.	1/-	4/3		30	30	7 1 3	4/3	3/2
Burco	5/-	19/9	+3d	35	25*	6 6 7	20/-	12/1
Chloride El Storage "A"	£1	66/-	−1/6	20	12½*	3 15 9	68/6	46/6
Clarke Chapman	£1	70/-		17½	20	—	73/-	47/6
Cole, E. K.	5/-	18/-		25	27½	—	19/6	11/6
Cossor, A. C.	5/-	9/6		10	10	5 5 3	11/-	7/-
Crabtree	10/-	30/6	−1/-	17½	20	6 11 2	32/-	23/9
Crompton Parkinson Ord.	5/-	21/3		20	20	4 14 3	22/-	14/-
De La Rue	5/-	20/-	−1/-	Nil	20	5 0 0	21/6	12/3
Decca	4/-	47/9	−9d	150	35*	—	51/3	32/-
Desoutter	5/-	25/9	+9d	18	20	3 17 8	25/9	16/1
Dewhurst	2/-	7/-		19	24	6 17 3	7/-	5/1
Dictograph Tel.	2/-	6/9		20	20	5 18 4	8/-	5/2
Dubilier Condenser	1/-	4/6		25	25	—	5/3	3/3
E.M.I.	10/-	21/6		8	10	4 13 0	24/-	11/3
Electrical Components	5/-	16/3		20	20	6 3 0	16/3	10/9
Elec. Construction	£1	70/-		15	15	4 5 9	70/-	53/-
Enfield Cable Ord.	£1	23/9	−9d	5	Nil	Nil	26/3	16/6
English Electric	£1	53/9	−2/6	15	10*	3 14 6	59/-	38/-
English Electric 3¾% Pref.	£1	16/9		3¾	3¾	4 9 7	16/9	15/3
Ericsson Tel.	5/-	31/9	−6d	22†	25†	1 19 3*†	33/9	22/9
Ever Ready	5/-	24/-		35	40	—	26/3	27/9
Falk Stadelmann	£1	47/-	+1/3	15	15	6 7 8	47/-	36/6
G.E.C. Ord.	£1	57/6	−1/3	11½	12½	4 7 0	60/-	37/6
G.E.C. 6½% Pref.	£1	28/9		6½	6½	4 10 6	28/9	26/6
General Cables	5/-	17/9		30	30	8 9 0	18/-	16/3
Greenwood & Batley	£1	55/-		17½	17½	6 7 3	55/-	40/3
Hackbridge Cable	5/-	14/9		20	20	6 15 6	15/9	11/3
Hackbridge & Hewittic	5/-	25/-		20	25	5 0 0	25/-	16/10
Hall Tel. Acc.	10/-	12/-	−6d	10	10	8 6 8	13/-	10/6
Heatrae	2/-	5/3		12½	12½	4 11 0	5/6	4/-
Henley's	10/-	18/-	−6d	10½	10½	5 16 8	22/-	15/6
Holophane	5/-	17/6		20	25	7 2 9	18/-	13/1

* After capital bonus. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

of the necessary meetings, and other details, are to be given shortly.

Radio Trust

Radio & Television Trust 2s shares changed hands at a little under 1s after the company's announcement, in the annual report, regarding an offer of £425,000 for the investment in the Britannic Cable Co. Bargains were recorded at around 5s 6d in the 6 per cent preference shares. If the deal is approved, says the report, the balance sheet will subsequently show the elimination of most of the half-million overdraft and an adverse balance of some £560,000 in the profit and loss account. The board will endeavour to devise a capital reconstruction scheme to deal with that adverse balance, the existence of which stands in the way of any dividend payments. Airmec, Ltd., the company's other main subsidiary, is reported to have increased its business during the latest year.

in Electrical Investments

Company or Board	Nom. Value	Middle price 13th Dec.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1954 Highest	1954 Lowest
Equipment and Manufacturing—continued.						£ s d		
Hoover	5/-	44/3	−1/-	25	45	5 1 9	51/-	26/3
I.C.I.	£1	40/-	−6d	13	15	3 15 0*	43/6	26/6
Intl. Combustion	5/-	26/3	−9d	15	20	3 16 3	30/-	14/6
Johnson & Phillips	£1	45/6	−1/6	15	15	6 11 9	52/6	45/6
Lancashire Dynamo	£1	55/-	−1/3	12½	14	5 1 10	59/6	43/-
Laurence, Scott	5/-	29/6	+6d	15	20	3 7 9	29/6	14/-
Lister, R. A.	£1	32/-	−6d	9	12	—	33/-	22/6
London Elec. Wire	£1	51/-	−6d	15	10*	3 18 6	54/-	38/-
Lucas, J.	£1	43/6	−1/6	10·8	7½*	3 9 0	49/-	25/3
Marryat & Scott	2/-	9/6		22½	25	5 5 3	9/6	5/11
Mather & Platt	£1	47/-	−6d	12½	15	—	53/-	32/-
Metal Industries	£1	33/6	−9d	12	9	5 9 1	42/3	29/6
Midland Elec. Mfg.	£1	43/9xc		15	15	—	43/9	31/6
Morphy-Richards	4/-	26/6		40	35*	5 5 9	26/6	11/4
Murex	£1	50/6		15	15	5 19 0	57/-	49/-
Newman Ind.	2/-	2/4½		10	10	8 8 5	2/6	2/-
Oldham & Son	1/-	3/3		17½	17½	5 7 9	3/4	2/5
Parnall (Yate)	5/-	10/9		6	8	3 14 6	11/-	4/3
Parsons, C. A.	£1	57/6	−2/6	12½*	7½*	2 12 3	60/-	38/1
Plessey	10/-	60/-		30	20*	3 6 8	62/-	37/10
Pye Deferred	5/-	33/6		20	20*	2 19 9	37/-	15/7
Revo	10/-	14/6	−6d	27½	9*	6 4 2	20/3	14/-
Reyrolle	£1	87/6		12½	13¾	3 2 10	92/6	66/-
Rheostatic	4/-	15/3		19	20	5 5 0	15/9	11/-
Richardsons Westgarth	5/-	11/-		15	15*	6 16 4	12/3	6/6
Scottish Cables	4/-	18/-	−1/-	20	27½	6 2 3	21/9	12/1
Siemens Ord.	£1	41/3	−1/3	10	10	4 17 0	44/-	33/9
Smith (England), S.	4/-	16/3	+3d	15	17½*	4 6 3	16/3	7/8
Southern Areas	£1	30/-	−2/6	6	7½	5 0 0	32/6	17/6
Strand Elec.	5/-	9/3		17½	17½	9 9 3	10/3	8/3
Sturtevant	5/-	22/-		18·1†	18·9*†	—	22/9	14/6
Sun. Elec.	£1	31/9	+2/6	15	15	8 17 6	33/9	27/6
Switchgear & Cowans	5/-	11/9	−3d	22½	10	4 5 0	13/7	9/9
Taylor Tunnicliff	5/-	11/3		25	12½*	5 11 0	12/4	10/7
T.C.C.	10/-	41/3	+1/3	20	30*	—	41/3	21/3
T.C. & M.	£1	33/6		10	8½*	5 1 6	34/6	30/3
Telephone Mfg.	5/-	9/6		10	10	5 5 3	9/6	7/6
Thorn Elec.	5/-	29/6		12½	20	3 7 9	30/6	13/3
Thornycroft	£1	36/-xc	−1/-	25	15	—	39/6	26/6
Tube Investments	£1	81/3		15	17½	3 16 2	81/3	60/3
Vactric	5/-	21/9	+2/3	Nil	10	2 6 0	21/9	7/6
Veritys	5/-	9/-	−1/3	10	12½	6 19 0	10/6	5/-
Walsall Conduits	4/-	52/6		70	70	5 6 8	52/6	44/-
Ward & Goldstone	5/-	42/-	−6d	45	50	—	43/6	21/-
Watford	2/-	6/6		25	22½*	—	7/3	4/7
Westinghouse Brake	£1	85/-	−1/3	15	16	3 15 5	86/3	60/9
West, Allen	5/-	17/6	−3d	15	17½	5 2 11	19/6	12/7
Wolf Electric	5/-	17/-	−6d	15	17½	5 3 0	17/6	11/-
Trusts, Transport and Communications								
Anglo-Am Tel.:								
A Ord.	100	88		6	6	6 16 4	89½	80
Ord.	100	54½		3¾	3¾	6 17 6	55½	52
Anglo-Portuguese	£1	24/9		—	8	6 9 4	25/9	21/-
Brit. Elec. Traction:								
Def. Ord.	5/-	20/6	−1/6	35	50	—	24/-	13/-
Cable & Wireless:								
Ord.	£1	40/-	−1/3	8	9	4 10 0	49/6	26/2
4% Loan	100	98½		4	4½	4 1 3	98½	95½
Calcutta Trams	£1	20/6		2½†	6†	5 17 0†	24/6	17/1
Cape Elec. Trams	£1	17/-	+1/-	5½	7	8 4 9	17/6	12/4
Marconi Marine	£1	33/6	+6d	10	10	5 19 6	35/-	27/6
Oriental Tel. Ord.	£1	97/6		16	16	—	99/1	82/6
Telephone Props.	£1	90/-		—	—	—	92/6	74/6
Telephone Rentals	5/-	10/6		10	10	4 15 3	10/6	9/-

Bruce Peebles

A meeting is to be held on 29th December to approve a 100 per cent scrip issue by Bruce Peebles. The £1 ordinary shares, which are quoted in Edinburgh, have been standing lately at around £6¼. According to the last balance sheet, the £178,000 ordinary capital was supported by reserves exceeding £750,000, reflecting the strict conservatism which has long characterized the dividend policy. As the result of a substantial expansion last year, earnings rose to the equivalent of over 130 per cent on the nominal capital; the dividend was maintained at 15 per cent (as for the two previous years) and augmented by a special 10 per cent bonus, which shareholders were warned not to regard as a regular distribution. Yield on the shares works out at 4 per cent on the basis of a total distribution of 25 per cent.

Notes

Siemens Bros. £1 shares were inclined to the dull side, changing hands down to 41s 6d, while awaiting details of the bid expected from A.E.I. A revival of activity in Vactric 5s shares was accompanied by talk of impending developments; recent dealings up to 22s were at the best level seen for about five years, during which the quotation has been down to 3s. Scottish Cable shares were not quotably altered by the report of an £800,000 contract for the South West Scotland Electricity Board.

New Globe Shares

Globe Telegraph & Trust new £1 ordinary shares, of which 1,118,000 were offered to existing shareholders, are being dealt in at a premium of about 18s 6d on the issue price of 20s. They are now 5s paid, with the balance due by 18th February next. Until then, they will be available for purchase free of transfer stamp duty. They will not qualify for the 3 per cent interim dividend expected on account of the current year (which ends in June) but will otherwise rank equally with the old stock. Present earnings are reported by the company to be running above last year's corresponding figures. The directors are satisfied that, in the ordinary way, earnings will justify maintenance of the final dividend at the former rate of 6 per cent. The prospective yield on the shares is thus rather more than 4½ per cent. The Trust has announced the intention of increasing its Canadian interests.

REPORTS and DIVIDENDS

Electric Furnace Company, Ltd.—The directors propose to make a bonus issue of 33,313 5½ per cent cumulative preference shares of £1 each to preference shareholders and to convert the existing 7 per cent cumulative preference shares into 5½ per cent cumulative preference shares of £1 each, all other rights remaining unchanged. The new preference shares will be issued in proportion to the existing holding in return for the shareholders accepting a lower rate of dividend of 1½ per cent. The new shares will rank *pari passu* with the old and will be entitled to the dividend for the second half of the year.

The directors also propose making a bonus issue of 156,500 ordinary shares of £1 each to ordinary shareholders in the proportion of one new share for every one held. The new ordinary shares will rank for the final dividend for the year ending 31st March, 1955.

The revised nominal capital will be £500,000 divided into 155,456 5½ per cent cumulative preference shares of £1 each, and 313,000 ordinary shares of £1 each. The balance of 31,544 will be unclassified shares and unissued at the present time.

The Radio & Television Trust, Ltd.—The main figures of the accounts for the year to 31st March last were given in our issue of 5th November. In the report now issued, the directors state that an offer of £425,440 has been made for the Trust's holding in the Britannic Cable Co., one of its two operating subsidiaries. The offer has been formally accepted by the board, but the agreement is subject to the purchaser obtaining the consent of the Capital Issues Committee to its proposed financial arrangement and the approval of the Trust's stockholders. Acceptance of the offer would reduce the Trust's bank overdraft from £500,000 to about £75,000, and the adverse balance on profit and loss by £184,085. The board states that until the adverse balance is dealt with by a capital reconstruction, there is no way of paying off any of the arrears of dividend on the preference capital and sinking fund certificates. The directors are endeavouring to devise a capital reconstruction scheme, but a drastic reduction of capital will be essential.

The Trust later announced that the offer for its shareholding in the Britannic Electric Cable Co. was from the General Cable Manufacturing Co. The condition imposed by General Cable as to the consent of the Capital Issues Committee does not now apply.

The Plessey Co., Ltd.—The accounts for the year to 30th June last were abstracted in our issue of 19th November. In his circulated statement Mr. A. G. Clark (chairman and managing director) says that in the aircraft industry they have widened their interests to cover an extensive range of mechanical and electrical components. In the domestic radio and television field their products are equally ubiquitous, and the company has built a reputation for its efforts in the design and development of many types of electronic apparatus. Much work has also been carried out for the Government both at home and overseas.

Aberdare Cables (Holdings), Ltd., is offering to buy out the minority shareholders in South Wales Switchgear, Ltd., and 134,700 of the 200,000 shares in Aberdare Engineering, Ltd. For every three of the 599,996 5s shares of South Wales Switchgear not already held by Aberdare Cables, the latter offers four of its 5s shares, while accepting shareholders of Aberdare Engineering will receive ten for every three £1 shares held.

Peto Scott Electrical Instruments, Ltd.—A preliminary statement shows a net loss for the year to 30th June last of £30,882, as compared with a loss of £38,364 for the preceding year. The board states that proposals for capital reduction and reorganization will be submitted at an extraordinary meeting following the annual meeting to be held later this month.

It is proposed to reduce the capital by writing off 1s 4d per 2s share and consolidating the balance into 1s shares. It is also proposed to create 1·2 million shares of 1s each. The present authorized capital is £125,000 of which £90,000 is issued.

Associated British Engineering, Ltd., has made an offer to purchase the whole of the issued share capital of British Polar Engines, Ltd., namely 102,651 ordinary shares of £1 each. Shareholders have signified their acceptance of the offer and arrangements are proceeding for ratification.

Parmiter, Hope & Sugden, Ltd.—It is announced that the proposed repayment of £30,563 5 per cent preference capital is not now taking place. The Inland Revenue has confirmed previous doubts that, because of the capitalization of reserves and the issue of ordinary shares to the ordinary shareholders in recent years, the proposed repayment would constitute a distribution of profits for the purposes of profits tax, in spite of the fact that the preference shareholders received no benefit from such capitalization.

British Insulated Callender's Cables, Ltd., has announced an interim dividend of 2½ per cent (unchanged).

Broadcast Relay Services, Ltd., are paying an interim dividend of 10 per cent, tax free (same), on increased capital.

Waygood-Otis, Ltd., has declared an interim dividend of 40 per cent (unchanged).

Pinchin, Johnson & Associates, Ltd., are paying an unchanged interim dividend of 7½ per cent.

Max Stone, Ltd., are paying an interim dividend of 30 per cent (against 20 per cent).

Vent-Axia, Ltd., has announced an interim dividend of 30 per cent (against 25 per cent).

George Kent, Ltd., are paying an interim dividend of 3 per cent (unchanged).

New Companies

Electric Windings (London), Ltd.—Registered 5th November. Capital £500. Directors: S. Ellenberg and D. E. Barker. Regd. office: 2a, Whites Row, E.1.

Wyvern Engineering Co., Ltd.—Registered 10th November. Capital £500. Electricians, mechanical engineers, manufacturers and dealers in electrical apparatus and goods, etc. Subscribers:—R. Lodge and E. R. Davell. Solicitors: Franks, Charlesly & Leighton, 21, Ely Place, E.C.1.

Refrigeration & Electrical (Sussex), Ltd.—Registered 12th November. Capital £1,000. Directors: G. H. Christmas. D. S. E. Herrtage and K. G. Christmas. Regd. office: 5, Bartholomews, Brighton, 1.

Edward Ward & Co., Ltd.—Registered 13th November. Capital £5,000, Manufacturers' agents for diesel, petrol and electrical engines and motors, generating plant, electrical switchgear, etc. Directors: W. E. Ward, D. H. Strathern, E. Sparkes and R. Sparkes. Regd. office: 10, Bridgeway House, Hammersmith Bridge Road, W.6.

W. & F. Dawson, Ltd.—Registered 1st November. Capital £15,000 . Electricians, mechanical engineers and manufacturers, etc. Directors: F. Dawson and Mrs. Alice G. Dawson. Regd. office: Eshton Terrace, Clitheroe.

Errington Electrical, Ltd. — Registered 25th November. Capital £500. Manufacturers and repairers of and dealers in electrical and mechanical apparatus and accessories, radio and television sets, etc. Directors: J. E. Clennell, F. D. Whiting and Kathleen M. Clennell. Regd. office: 84, Tolmers Road, Cuffley, Herts.

Tappelectric, Ltd.—Registered 25th November. Capital £1,000. Electrical engineers and general electrical installation contractors, lighting specialists and contractors, radio engineers, etc. R. E. Tappenden is the first director. Regd. office: Druid Hill, Bristol, 9.

Autolec Boilers, Ltd.—Registered 30th October. Capital £1,000. Electrical, mechanical and general engineers; makers and manufacturers of and dealers in boilers, furnaces, tubes, fittings and coverings, economizers, turbines, engines, etc. The first directors are not named. Solicitors: Clifford-Turner & Co., 11, Old Jewry, E.C.2.

Industrial Tilt Switch Co., Ltd.—Registered 4th December. Capital £1,000. Electrical equipment specialists, manufacturers of and dealers in switchgear, batteries, accumulators, magnetos, dynamos, plugs, transformers, etc. Directors: R. A. Crawford and S. G. Coller. Regd. office: 26, Craven Street, W.C.2.

Liquidation

Lincoln & Egerston, Ltd., contractors (in voluntary liquidation).—Meeting, 11th January, at 2, South Quay, Great Yarmouth, to receive an account of the winding up by the liquidator, Mr. R. G. S. Sisson.

Bankruptcies

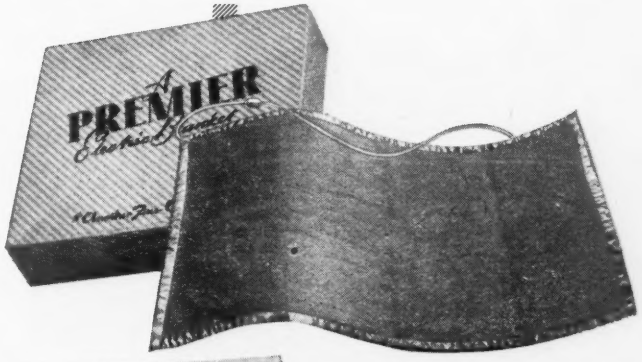
C. T. Boden, carrying on business as a wholesale electrical, hardware and fancy goods dealer under the name of the High Peak Wholesale Electric Supplies at 5, Hartington Street, Derby, and as a retail electrical, hardware and fancy goods dealer at "Anafon," Abergele Road, Old Colwyn, Flint—Receiving order made 3rd December on debtor's own petition.

M. C. Usher, electrical contractor and decorator, 31, Ranelagh Garden Mansions, Hurlingham, London, S.W.6.—Trustee, Mr. W. F. Cresswell, Bankruptcy Buildings, Carey Street, London, W.C.2, Senior Official Receiver, released 6th December.

G. L. Searle, lately carrying on business as an electrical engineer at 309, Portobello Road, London, W.10.—First and final dividend of 4d in the £, payable 23rd December at Bankruptcy Buildings, Carey Street, London, W.C.2.

All your customers will want these Premier electric blankets

Here are two electric blankets that will appeal to ALL your customers. A luxury blanket for those whose preference is on quality or the effective yet inexpensive model. Both blankets are fitted with efficient elements safely insulated and secured in fire-proofed material. They are attractively packaged and will prove a colourful addition to your window display.

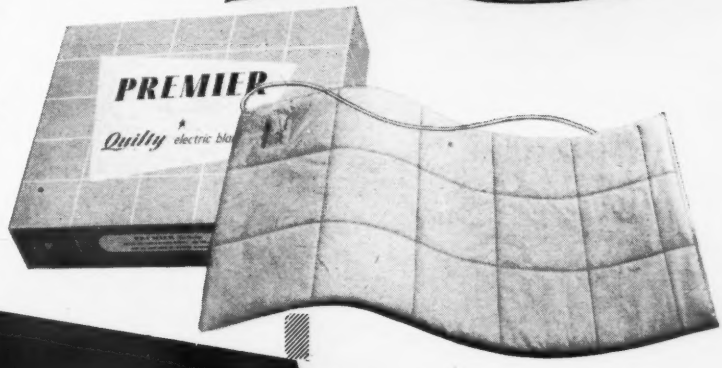


WARMWELL

A de-luxe blanket made in three colours of soft fleecy material. The edges are attractively bound with rayon, and fitted with nine feet flexible cord and on-off switch.

Size 54" x 30". Cat. No. B.202 Pink, B.203 Green, B.204 Blue. AC and DC.

£5 18s. 0d. plus £1 1s. 6d. Purchase Tax. Covers to match £1 5s. 0d. plus 4s. 7d. Purchase Tax (*No Purchase Tax if sold separately*).



QUILTY

A new popular blanket made of hard wearing white calico, element construction being similar to the Warmwell and fitted with nine feet flexible cord, but without on-off switch. AC and DC.

Size 54" x 30". Catalogue No. B.303.

Price £4 12s. 6d. plus 16s. 11d. Purchase Tax.

Calico covers 15s. plus 2s. 8d. Purchase Tax (*No Purchase Tax if sold separately*).

stock and sell **PREMIER** *Fine-Quality* electric blankets

PREMIER ELECTRIC HEATERS LTD., BIRMINGHAM, 9

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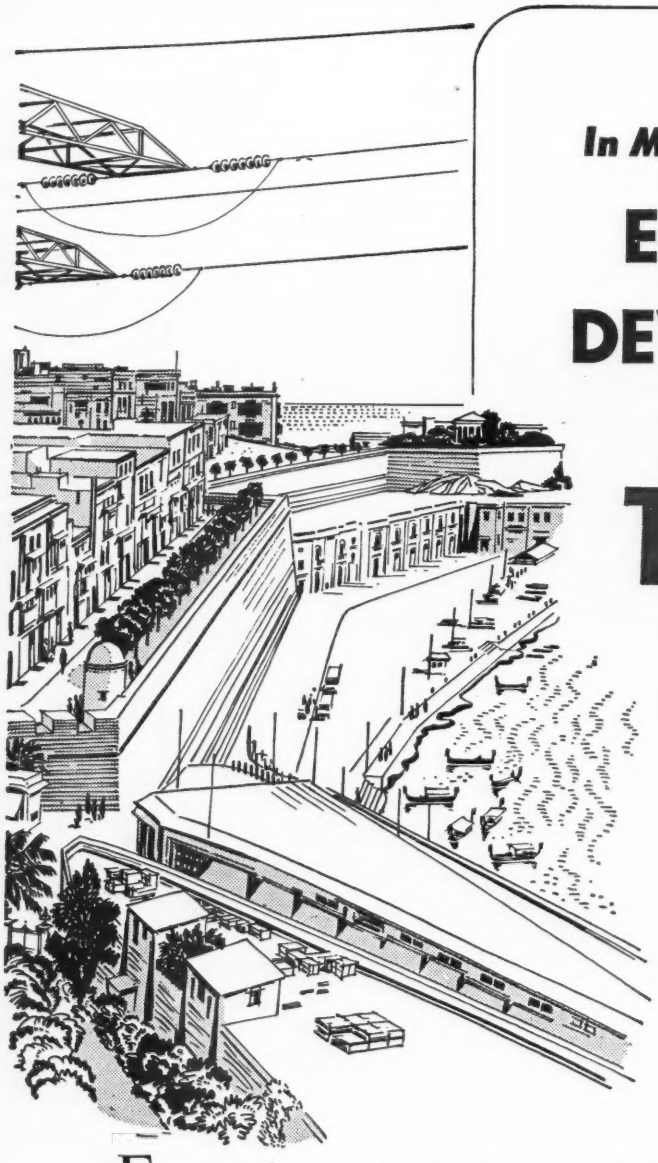

In Malta as in Great Britain

ELECTRICAL DEVELOPMENT depends on TUDOR

Tudor are supplying fifty 30-volt self-contained switch tripping equipments to J. G. Statter & Co. Ltd. to whom the Crown Agents, on behalf of the Malta Government, have awarded the contract for supply of the 11 kV switchgear required for reconstructing the distribution system. The Consulting Engineers are Messrs. Preece, Cardew & Rider. The reconstruction involves changing from single phase, 100 cycles to 3-phase, 50 cycles which will enable the l.v. system to be standardised at 415/240 volts, 50 cycles.

FOR OVER FIFTY YEARS The Tudor Accumulator Company has specialised in the design and manufacture of batteries for switchgear operation, indication and emergency duties in power stations and substations; and Tudor Batteries have played a large part in the recent expansion of electricity supply in Britain. Wherever they are in service, Tudor Batteries are noted for their outstanding reliability and low maintenance cost under all conditions.

Tudor engineers will be pleased to prepare a specification of the most economical battery scheme to meet your requirements.

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T.131

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NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 19th January from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1949

21044. — Postmaster General. — Automatic telephone exchange systems. 31st July, 1950. (722172.) 25652. Automatic telephone exchange apparatus. 14th September, 1951. (722173.) 25653. Communication circuit arrangements. 21st August, 1951. (722174.)

27283. Thermionic Products, Ltd. (Brush Development Co.).—Production of magnetizable material. 24th October, 1949. (722175.)

1950

5195. W. T. Henley's Telegraph Works Co., Ltd., Booth, D. H., and Johnson, O. S.—Insulating and dielectric compositions for electric cables. 27th February, 1951. (721991.)

8477. Postmaster General. — Automatic telephone systems. 28th December, 1951. (722178.) 12386. Electrically operating selecting systems. 3rd May, 1951. (722179.)

13105. Electric & Musical Industries, Ltd. —Apparatus for scanning kinematograph film, for the purpose of generating or recording television signals. 25th May, 1951. Addition to 690482. (721992.)

16699. Siemens Electric Lamps & Supplies, Ltd., Doherty, M. T., and Sergeant, G.—Fluorescent materials. 29th June, 1951. (721993.)

1951

918. General Electric Co., Ltd., and Griffith, G. W. S.—Electrical communication systems. 9th January, 1952. (721941.)

1766. London Electric Wire Co. & Smiths, Ltd.—Production of electrically insulated wire. 21st January, 1952. (722094.)

3248. Siemens Electric Lamps & Supplies, Ltd.—Fluorescent materials. 8th February, 1952. (721998.)

10971. Pye, Ltd.—Television pick-up tube arrangements. 2nd May, 1952. Cognate application 15980, 5th July, 1951. (721943.)

12955. Siemens & Halske Akt.-Ges.—Electron lens. 31st May, 1951. (722096.)

14688. M-O Valve Co., Ltd., and Dutt, T. L. — Gas-filled electric-discharge devices. 20th June, 1952. (721945.)

16273. English Electric Valve Co., Ltd.—Television pick-up cathode ray tubes. 17th March, 1952. (721948.)

21006. Strub, R.—Circuit arrangement for employment in telephone installations, for the selection of line groups. 5th September, 1951. (722102.)

21294. Jacquier, M. C. J.—Protective circuit for an accumulator battery comprising cells connected in series. 10th September, 1951. (722103.)

21870. Yorkshire Copper Works, Ltd.—Electrically heated devices for generating a stream of heated gas, and more especially blow pipes. 2nd September, 1952. (722104.)

24289. General Electric Co., Ltd., and Small, G. F.—Electric filter arrangements. 19th January, 1953. (722021.)

28779. Collinson, R. F.—Wire wound potentiometers and variable resistors. 9th March, 1953. (721952.)

29142. National Research Development Corporation.—Synchronous electronic circuits. 11th December, 1952. (722108.)

29624. General Electric Co., Ltd., and Bryden, J. E.—Electrical apparatus of the kind in which an image is arranged to be produced on the screen of a cathode-ray tube. 21st November, 1952. (722031.)

1952

3853. N.S.F., Ltd. — Electric wafer switches. 28th January, 1953. (721959.)

3992. Metropolitan-Vickers Electrical Co., Ltd.—Drying of materials. 13th February, 1953. (722116.)

4625. General Electric Co., Ltd., Fletcher, F., and Blackwell, A.—Mimic diagrams for electrical networks or remote control systems. 27th January, 1953. (722035.)

7229. Associated Electrical Industries, Ltd. —Separation of charged particles. 17th March, 1953. (722119.)

8354. Chromatic Television Laboratories, Inc.—Direct-view cathode-ray tubes for colour television. 2nd April, 1952. (722282.)

9550. General Electric Co., Ltd., Nixon, F. J., and Peddle, E. A. R.—Electronic counter apparatus. 3rd June, 1953. (721964.)

9749. Union Carbide & Carbon Corporation.—Electrical contact brush. 15th July, 1953. (722122.)

10170. Electric & Musical Industries, Ltd. —Variable electric resistances and potentiometers. 23rd April, 1953. (722284.)

10477. General Electric Co., Ltd., and Sowter, A. B.—Cold pressure welding. 31st March, 1953. (721965.)

11071. General Electric Co., Ltd., Elliot, E. W., and Hunt, G. J.—Electric pulse generating apparatus. 1st May, 1953. Cognate application 11380, 24th April, 1953. (722204.)

11072. General Electric Co., Ltd., and Elliot, E. W.—Apparatus for testing the frequency characteristics of electric signal transmission channels. 1st May, 1953. Cognate application 11381, 24th April, 1953. (722205.)

11949. English Electric Co., Ltd.—Hydraulic turbines. 8th May, 1953. Cognate application 30923, 5th December, 1952. (722048.)

14037. Ruhrchemie Akt.-Ges., and Stein-Kohlen-Elektrizitaets-Akt.-Ges.—Process for the direct electrochemical conversion of the chemical energy of carbon or of combustible gases into electrical energy. 3rd June, 1952. (722130.)

14698. Etablissements E. Jaeger.—Panel mounting electric lampholders. 11th June, 1952. (722134.)

14732. Radio Corporation of America.—Cathode-ray tubes. 11th June, 1952. (722213.)

15031. Microwave Instruments, Ltd., and Bilbrough, J. — Standing wave detector mechanisms for waveguides and transmission lines. 12th June, 1953. (722288.)

15492. Phillips & Bonson, Ltd.—Connection of ammeters in electric circuits. 9th June, 1953. Cognate application 30569, 2nd December, 1952. (722290.)

15984. Standard Telephones & Cables, Ltd. —Electromagnetic relays. 19th June, 1953. (721970.)

16429. Lip Soc. Anon. d'Horlogerie.—Electric clocks. 30th June, 1952. (722137.)

16885. General Electric Co., Ltd., and Lewis, W. E.—Electric motors more particularly for electric locomotives and to bearing arrangements therefor. 23rd June, 1953. (722061.)

17008. Burroughs Adding Machine Co.—Electron discharge apparatus. 7th July, 1952. (722215.)

17628. New Consolidated Gold Fields, Ltd., and Symes, H. E. J.—Control of electrically driven wheeled vehicles. 11th July, 1952. (722293.)

17732. Calor-Emag Elektrizitäts Akt.-Ges. —Electrical switchgear. 14th July, 1952. (721972.)

17822. Lucas (Industries), Ltd., J.—Electric circuit connecting means of the plug and socket type. 14th July, 1953. (722142.)

18124. Mond Nickel Co., Ltd.—Nickel-chromium alloys for electrical resistances. 16th June, 1953. (722145.)

18222. General Electric Co., Ltd., Allen, C. P., and Bard, F. B.—Electrical wave propagation apparatus comprising a slotted hollow tube. 16th July, 1953. (722217.)

18350. Winsted Hardware Manufacturing Co.—Food and beverage electric hand mixer. 21st July, 1952. (722294.)

19179. Hivac, Ltd.—Cold-cathode gaseous discharge tubes. 23rd March, 1953. (721973.)

19339. Santon, Ltd.—Electric immersion heaters. 28th October, 1953. (722220.)

19794. Philips Electrical Industries, Ltd.—Television pick-up tubes. 6th August, 1952. (722150.)

19858. Goldstaub, H. H.—Thermionic valve retainers. 6th August, 1953. (722221.)

19879. Santon, Ltd.—Rotary electric switches. 7th August, 1953. (722222.)

20204. Hunt (Capacitors), Ltd., A. H.—Electrical capacitors. 19th February, 1953. (722296.)

20359 & 20531. Westinghouse Electric International Co.—Dynamo-electric machines. 13th and 15th August, 1952. (722151/2.)

22169. Westinghouse Electric International Co.—Protection of electrically propelled vehicles. 3rd September, 1952. (722156.)

22424. Metropolitan-Vickers Electrical Co., Ltd.—Gas turbine plant. 12th August, 1953. (722230.)

22943. Kaiser Aluminium & Chemical Corporation.—Electric furnaces and electrodes therefor. 12th September 1952. (721980.)

22954. Philips Electrical Industries, Ltd.—Circuits for silent tuning of radio receivers. 12th September, 1952. (722158.)

23199. Pearce, J. W. A.—Electric thermal cutouts. 16th September, 1953. (722159.)

25431. Philips Electrical Industries, Ltd.—Tubular electric-discharge lamps. 10th October, 1952. (722165.)

27056. Standard Telephones & Cables, Ltd.—Electrical circuits using multi-gap gas-filled discharge tubes. 28th October, 1952. (722240.)

27192. Chatham Electronics Corporation. —Heat-shielded cathode. 29th October, 1952. (721983.)

28158. Compagnie Générale de Télégraphie sans Fil.—Frequency modulated u.h.f. circuit arrangements. 7th November, 1952. (721985.)

28953. Standard Telephones & Cables, Ltd. —Assembly of thermionic valves. 17th November, 1952. (722244.)

29357. Telephone Manufacturing Co., Ltd. —Electric communication systems. 25th September, 1953. (722302.)

29819. Accumulatoren-Fabrik Akt.-Ges.—Electrodes for secondary batteries especially those having alkaline electrolytes. 25th November, 1952. (722081.)

30074. Westinghouse Electric International Co.—Fluorescent screens. 27th November, 1952. (722082.)

31794. Naimer, H.—Locating mechanisms for use with switches. 15th December, 1952. (721989.)

32670. Allis-Chalmers Manufacturing Co. —Cross-gas blast electric circuit breaker. 23rd December, 1952. (722248.)

1953

12887. English Electric Co., Ltd.—Hydraulic turbines. 8th May, 1953. Divided out of 722048. (722088.)

GENERATION AND DEVELOPMENT

Pinkston Power Station Extension

A £2,237,700 extension of Glasgow Corporation's Pinkston power station was opened on 3rd December by Mr. Thomas Johnston, chairman of the North of Scotland Hydro-Electric Board. The improvements and extensions have virtually doubled the station's capacity and the frequency has been standardized so that power can be interchanged with the grid. Whatever the future might hold, Mr. Johnston thought that there could be no possible criticism of the policy of increasing the availability of power for production. He thought that Glasgow might well retain Pinkston for the purposes for which it was originally planned and dispose of its surplus at a fair and reasonable figure to the South West Scotland Electricity Board. Work began on this Pinkston project in 1948. There still remain a number of developments to complete including the installation of an additional large boiler. The extension is a self-contained unit consisting of a 30 MW turbo-alternator, two 150,000 lb/hr forced-circulation boilers having steam conditions of 600 lb/sq in and 850 deg F, and a 3,500,000 gal/hr cooling tower.

The turbo-generator set which with other equipment has been supplied by the Metropolitan-Vickers Electrical Co., Ltd., has a two-cylinder turbine designed for steam conditions of 600 lb/sq in, 850 deg F at the stop valve. The turbine exhausts at a vacuum 28·7 in Hg to a condenser supplied by G. & J. Weir, Ltd. The generator which is rated at 35,295 kVA (0·85 p.f.) and generates at 6·6 kV, is generally of Metropolitan-Vickers standard design in this range.

Eastern Board's Finances

By the end of 1956–57 the Eastern Electricity Board will require additional revenue of the order of £3,000,000 a year. This was announced by Ald. W. J. Bennett, chairman of the Consultative Council for the Area, at a special meeting held in London last week. He said that this would no doubt come as a tremendous shock to consumers who would have read of the prosperity of the industry as reflected in the profit of £13¼ million shown in the B.E.A.'s accounts for 1953–54. The Eastern Board—one of two that were in deficit—had earlier indicated that it did not propose to make any change in tariffs until it had reviewed conditions next April, but the continued rise in costs, particularly of coal, had made an increase in charges unavoidable.

Ald. Bennett explained that the Board's proposals to raise the additional revenue were still under discussion with the Council's Tariff Sub-Committee. The effect was likely to be an all-round rise, which would come into operation probably at the beginning of April. He pointed out that the Board's own expenditure (i.e., excluding the bulk supply charges) had shown a progressive decrease and it was estimated that this would continue over the next two years. Last year one brief " cold snap " had cost them an extra £½ million which in his opinion was merely a book transfer from the Board to the Central Authority. Electricity Boards were encouraged to sell electricity to industrialists on a monthly demand basis, he said, but they themselves had to pay the increased demand charge for the whole twelve months.

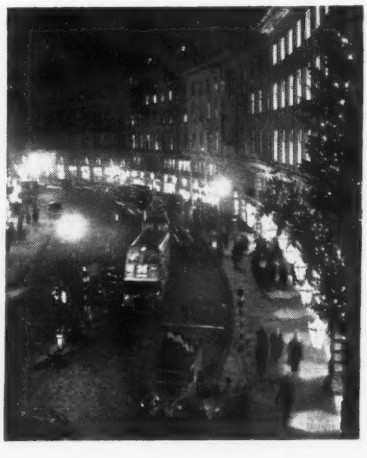
Owing to the fact that the meeting was one short of a quorum no formal recommendation was made but it was indicated that the General Purposes Committee proposed to write to the Board saying that it was not entirely in agreement with the suggested methods of raising the additional revenue. It was felt that Consultative Councils were hampered by not being able to call for details of the make-up of bulk supply charges and that they were entitled to such information if they were effectively to discharge their duty to consumers.

No Saving with Outdoor Meters

Following an investigation carried out by a team of three consumers, the view was expressed in a report to the North Western Electricity Consultative Council that the use of outdoor meters would not cut the cost of meter reading. The reading of credit meters four times a year was estimated to cost 2s 5d and if the Board had to spend 30s to provide, install and protect an outdoor meter—it would undoubtedly cost more—the annual charges would be 2s 6d. A further difficulty was that, for safety reasons, prepayment meters could not be fixed outdoors.

Bankside Building Rates

Loss of revenue because the British Electricity Authority's headquarters at Bankside are exempt from the rating provisions of the Local Government Act, 1948, is worrying Southwark Metropolitan Borough Council. In a letter to the Association of Municipal Corporations, the Council called attention to the objections made by itself and the London County Council at the time it was proposed to erect the new Bankside power station.



A general view of the gaily coloured lanterns and Christmas trees in Regent Street, London. Two hundred picturesque 5ft high plastic lanterns, alternately red, green and blue, are spaced at 18ft intervals along the thoroughfare. Above many of the lanterns are small Christmas trees, gay with coloured lights

The Council pointed out that if it had been known that opposite the power station there was to be erected a large block of offices for use by the electricity authority, then its objections would have been " even more strenuous." Offices used as headquarters for the whole of the country should be brought into rating.

A report from the Rating Committee of the Association states that while it sympathizes with the Council's views upon the inadequacy of the existing law relating to the rating of premises used by national boards as part of their central organization, it considers that it would be unwise for the Association to make representations at this stage. The matter would, however, be borne in mind when any Bill dealing with rating generally was under consideration.

Sewage Works Charges

A borough council has asked the Association of Municipal Corporations to take up the question of the imposition of a maximum demand charge in the tariff for the supply of electricity to its sewage pumping station. It says that it is reasonable to penalize consumers who, because of their large demands upon the supply available at certain times of the year, use a greater amount of electricity at particular times. It is suggested that this practice cannot be justified in the case of a sewage pumping station as the local authorities' demand upon the electricity supply " must be governed entirely by circumstances outside their control."

The General Purposes Committee of the Association says that this method of charging has been in operation for very many years, and in the circumstances it does not see its way to making representations in the matter.

Bombay Transmission Scheme

The first part of the Jog–Karnatak grid scheme—the Harihar to Haveri section—was put into commission last month by the Chief Minister of Bombay (Shri Morarji Desai) who said that for the supply of electricity from Jog to the Karnatak areas the Bombay Government had so far spent about Rs 3 crores (£2,250,000). Work on the Sirsi–Hubli section is expected to be completed towards the middle of next year.

Successful Railway Electrification

Since the electrification of the Manchester–Sheffield line passenger traffic on the line has shown a remarkable increase. British Railways announced last week that traffic on the Manchester–Glossop section, in particular, had shown a rise of 125 per cent since June.

School Lighting

Durham County Education Committee has under consideration the installation of electricity in schools at West Pelton, Hunstanworth, Satley, Willington, Bishop Auckland, Greatham and Blackwell. The Committee has approved the rewiring of Medomsley Edge County School at a cost of £1,750.

Supplies to Council Homes

In place of the large institutions of the past, children's and old people's homes are now generally established in small units. Owing to the tariff structure, these are usually classified as commercial premises for the purpose of electricity charges. The Middlesex County Council, in a

representation on this point to the Eastern Electricity Consultative Council, said that it had taken over a number of houses for use as homes and it submitted that the change of ownership from a private family to the Council did not alter the electrical characteristics and that the domestic tariff should continue to be applicable. The Consultative Council's General Purposes Committee proposes to suggest to the Eastern Board that this matter should be taken up with the Central Authority with a view to a standard arrangement being adopted throughout the country.

Peat as a Source of Power

The need to continue the study of peat as a source of power was stressed at a luncheon given in Glasgow on 4th December by the Scottish Peat and Land Development Association. The time must come, said Mr. C. W. Marshall, divisional controller, B.E.A., when coal prices would reach a level which would make it essential to burn peat. There must be continuity of experiments on a sufficiently large scale to demonstrate convincingly to generating engineers the value of peat as a combustion material.

Interest of the B.E.A. was so far confined to the specific subject of using peat as an alternative to coal in generating stations. So far the Barony station in Ayrshire had been regarded as perhaps the only station capable of burning peat on a large scale and Barony was due to go into commercial use on 1st January, 1957, although experimental work would begin about the middle of 1956. Before peat could be used on any large scale there it would be necessary to undertake experiments on a reasonably large scale to determine whether peat would burn efficiently with coal in existing generating stations. The most effective method of burning peat from the technical viewpoint might be to mix it in dry powder form with pulverized coal. The most practical method economically would be to burn peat in semi-dry condition on chain grate stokers in existing power stations. On the long term view, the gas turbine proposals appeared to offer best scope.

Mr. John Henderson, chief engineer, S.W. Scotland Electricity Board, thought there might be scope for burning peat in the destructor station at Govan, since the low ash content of peat would reduce grit and achieve improved amenity in this area.

Thousandth Substation

The thousandth substation in the No. 1 Sub-Area of the North Western Electricity Board, which covers greater Manchester, Salford and Altrincham, was officially switched on on 7th December by Alderman R. S. Harper, the Lord Mayor of Manchester. The new substation is constructed in a cellar below Albert Square and is one of a ring of substations which form part of a reinforcement scheme, the need for which is related both to the steady increase in the demand for electricity in the heart of commercial Manchester and to the development of smokeless zones. The density of load at the present time in the centre of Manchester is greater than anywhere else in the country, with the possible exception of the centre of the City of London. The number of consumers now over 400,000.

The Lord Mayor of Manchester, Alderman R. S. Harper, switching on the new Albert Square substation

Crompton 140 W sodium lamps in "Corona II" lanterns at Pontardawe

Street Lighting

Sodium lighting will be used on the Birmingham–Lichfield road through SUTTON COLDFIELD at the request of the Ministry of Transport, which stated it would be more efficient and economical than mercury vapour lighting suggested by the Town Council.

OSWESTRY Corporation has authorized the borough surveyor to prepare a scheme for the improvement of the street lighting in the accommodation road off Whittington Road.

Sodium lighting to Group A standard has been installed in Pontardawe and Clydach under the direction of Mr. D. S. F. Williams, engineer to the Pontardawe R.D.C. The equipment comprises Crompton "Corona II" lanterns with 140 W sodium lamps and was installed by the South Wales Electricity Board.

HELSTON Town Council is to seek information concerning the cost of electric street lighting where cable is available.

Automatic Telephony in the Netherlands

The Director-General of the Netherlands Postal, Telegraph and Telephone Services has stated that the country's telephone system has now been made automatic to the extent of 92 per cent and will become fully automatic during the next four to five years. In view of the great increase in telephone communication with foreign countries, a second cable to the United Kingdom and a cable to Denmark will be laid next year.

Power Station Emissions

B.E.A. Statement

THE British Electricity Authority, at its first meeting since the publication of the report of the Beaver Committee on Air Pollution, gave careful consideration to the views of that Committee, particularly the proposal that gas washing should be introduced at all new power stations.

The Authority has issued a statement in which it says that gas washing has a long history and has been actively explored by all parties including the Government, the electricity supply industry and the public health interests. Despite the Beaver Committee's views, it is by no means established that gas washing can be effectively introduced. Moreover, the Committee itself recognized that the complete removal of sulphur dioxide from power station gases would leave more than three-quarters of the sulphur problem unsolved.

Certain technical considerations are discussed in the Committee's report, but there are many complicated features which the Government and the Authority will have to take into account in reaching their decisions. While some of the references in the report are ambiguous, the Authority is submitting to the Government the relevant factors, including the heavy capital cost which, covering also further grit arresting installations, could not be less than £140 million and might even reach £250 million within the next 10 years. This, together with the extra operating costs, would involve an increase of at least 12 per cent in the generation cost.

Notwithstanding these considerations, the Authority is prepared to face the financial liability incurred in installing gas washing plant at power stations when it is satisfied, after consultation with the Government, that this is the right course to pursue on grounds of national interest and public health. Whatever the Government's decisions may be, the Authority will loyally and energetically seek to implement them.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—7th February. Agent General for Western Australia, London. Boiler feed pumps and valve equipment. (E.S.B. 28503/54. Ten/11757.)*

Birmingham.—7th January. Corporation. Electrical installation and an electric lift at Aged Persons' Home. (See this issue.)

Carlisle.—14th January. Corporation. Electrical installation in 100 houses. Plans by the city engineer, 18, Fisher Street.

Coventry.—21st January. Corporation. Electrical work at Limbrick Wood Infants' School. (See this issue.)

Crawley.—Parish Council. Street lighting equipment. (See this issue.)

Durham.—County Council. Electrical installations in schools. (See this issue.)

Fareham.—19th January. U.D.C. Electrical fittings and lamps for one year. Forms from the surveyor, Westbury Manor, West Street.

Formosa.—30th December. Taiwan Power Co., Taipei. Two 60 b.h.p. diesel generator sets, cables and fittings. (E.S.B. 28289/54. Ten/11755.)*

Greece.—3rd January. Greek Social Insurance Institute, Athens. One hospital lift and two passenger lifts. (E.S.B. 28458/54. Ten/11739.)*

Ilford.—10th January. Town Council. Lamps for one year. Forms from the borough engineer, Town Hall.

India.—21st December. Director General of Supplies and Disposals, New Delhi. Seven electrically-driven deep well turbine pumps. (E.S.B. 28292/54. Ten/11698.)*

16th February. Government Department of Electricity, Madras. Power transformers and outdoor switchgear for Periyar power station. (E.S.B. 28180/54. Ten/11692.)*

Iraq.—21st December. Directorate General of Municipalities, Bagdad. Ten 100 kVA transformers. (E.S.B. 28258/54. Ten/11707.)* 31st January. 100 kW alternator set for Faisaliya. (E.S.B. 28736/54. Ten/11779.)*

London.—22nd February. India Store Department. Electronic valve making machines and equipment. (See this issue.)

Luxembourg.—23rd December. Luxembourg Army. Nineteen generating sets ranging from 2 kVA to 10 kVA. (E.S.B. 28482/54. Ten/11733.)*

New Zealand.—8th February. Stores Division, G.P.O., Wellington. Six transformers. (E.S.B. 28277/54. Ten/11712.)*

1st March. Dunedin Electricity Department. Two 15 MVA 31/6·6 kV transformers. (E.S.B. 28504/54. Ten/11738.)* 22nd March. 6·6 kV switchboard. (E.S.B. 28631/54. Ten/11764.)*

Philippines.—7th January. National Power Corporation, Manila. Galvanized steel towers, leg extensions and appurtenances. (E.S.B. 28111/54. Ten/11674.)*

South Africa.—5th January. Stores Department, South African Railways, Johannesburg. Underground armoured telephone cable. (E.S.B. 28622/54. Ten/11742.)*

20th January. Johannesburg City Treasurer's Department, Stores and Buying Branch. 20 kV cable, pilot and telephone cable and accessories. (E.S.B. 28704/54. Ten/11765.)*

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

Spain.—10th January. Iberduero, Madrid. Iron fittings and insulators for h.v. lines. (E.S.B. 28092/54. Ten/11770.)*

Turkey.—15th February. Turkish Provincial Bank. Hydro-electric power station (6,300 h.p.) at Bendimahi, in Van Province, with 66 kV overhead line. (E.S.B. 27200/54. Ten/11766.)*

Whiston.—16th January. Parish Council. Street lighting. (See this issue.)

ORDERS PLACED

Barking. — Corporation. Recommended. Sodium type street lighting in Lodge Avenue (£2,659).—Harland & Wolff.

Darlington.—Newcastle Regional Hospital Board. Electrical work in additions at Greenbank Hospital (£3,537).—Falconar, Cross & Co.

Durham.—County Education Committee. Electrical installations in schools:—Edmondsley County (£1,180).—Dougal and Railton. Houghton-le-Spring Grammar (£3,695).—Steels Engineering Installations.

Poplar.—Borough Council. Accepted. Electrical installation works for 16 shops and maisonnettes in Aberfeldy Street (£1,150) and 13 shops and 14 maisonnettes, St. John's Parish area (£1,050).—Hancox & Co., Ltd. Electrical installations and fittings for 54 flats, St. John's Parish area (£2,374).—Engineering Services Installations, Ltd.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bath.—Junior school, Upper Weston; Gerrard Taylor & Partners, architects, 4/5, Bridge Street.

Buckinghamshire. — Secondary modern schools at Cippenham, Marlow and Wing/Linslade, and C.E. primary schools at Beaconsfield and Sherington; county architect, County Hall, Aylesbury.

Bury.—Bus station; borough engineer.

Coventry.—Four hostel blocks, teaching blocks, staff accommodation, etc., as part of training college; city architect, Bull Yard, off Warwick Row.

Deal.—Fire station, London Road (£32,000); Kent county architect, Springfield, Maidstone.

Exeter.—County offices (£500,000); Donald H. McMorran, architect, 14, North Audley Street, London, W.1.

Flats (56); city surveyor, 7, Southernhay West.

Fleetwood.—Freezing and processing factory, Copse Road; Dick Ward, Ltd., fish merchants, Wyre Dock.

Great Yarmouth.—Amenity hall at rear of Plaza Cinema, for conferences, dances, etc. (£125,000); L. Allen, architect, Eagle House, Jermyn Street, London, S.W.1.

Hanwell.—Works extensions; Hygrade Corrugated Cases, Ltd., Southall Trading Estate, Boston Road, London, W.7.

Ilford.—Beal Grammar/Technical School (£200,000); Mossford Primary School (£49,000) and craft block at Downshall School; borough engineer, Town Hall.

Leeds.—Flats (448) and six shops, Saxton Gardens area; Geo. Calverley & Sons (Contractors), Ltd., Leicester

Lichfield.—Erection of Wheel Lane County Primary School (£40,860); J. & F. Wootton, Ltd., Pinfold, Bloxwich.

Liverpool.—Development of Lord Street/North John Street corner site for business premises; W. Barratt & Co., Ltd., Footshape Works, Northampton

London.—Office block, 3/10, Finsbury Square; Lewis Solomon, Son & Joseph, architects, 21, Bloomsbury Way, W.C.1.

Lye (Worcs).—Factory extensions, High Street/Bromley Street corner; J. W. New, Ltd., carpet manufacturers, 95, Upper High Street.

Maidstone.—Shops and showrooms, 105/7, Week Street, for Times Furnishing Co.; Carl Fisher, architect, 27, Grosvenor Place, London, S.W.1.

March.—Houses (87), Upwell Road; Charles W. Shelton Ltd., estate developers, Rutland House, Eastgate, Peterborough.

Middlesbrough.—Rehousing of 2,000 people under a clearance scheme; J. A. Kenyon, borough engineer, Municipal Buildings.

Houses, flats and bungalows (738), Pallister Park estate; borough engineer.

Mitcham.—Dwellings, Short Bolstead and Ravensbury estates; H. A. Sandford, consulting electrical engineer, 2, Gate Street, London, W.C.2.

Newcastle-on-Tyne.—Additions to the College of Art and Industrial Design; G. Kenyon, city architect, 18, Cloth Market.

North Riding.—Ambulance stations at Haxby, Guisborough and Whitby; county architect, County Hall, Northallerton.

New schools at South Bank (£57,200) and Cleveland (£37,650) and technical college at Cleveland (£137,650); county architect.

Notts.—Phase 1 of Nuthall Larkfields Primary School; J. W. Stamp & Co., Ltd., Nuthall Road, Bobbersmill, Nottingham.

Prudhoe (Northumberland).—Shops and flats (£17,390); E. Jeffcock, Ltd., builders, New Bridge Street, Newcastle-on-Tyne.

Rainford.—Library (£10,676); county architect, County Offices, Preston.

Rochdale.—Dwellings (114), Kirkholt estate; borough surveyor.

Romford.—Dwellings (112), Stockland Road and Lodge Lane; borough surveyor.

Shops and flats, Dagenham Road; Evans Bros., Ltd., 98, Dagenham Road.

Scunthorpe.—Erection of new municipal offices (£250,000); Charles Pearson & Son, architects, 24, Loxford Street, Manchester, 15.

Seaton Valley (Northumberland).—Houses (140); T. W. Burgess, surveyor, U.D.C. Offices, Seaton Delaval.

Sheffield.—Large extensions to works (about (£100,000); C. & J. Hampton, Ltd., tool manufacturers, Head Office, Bernard Road, 2.

Sheldon (Solihull).—Factory, Lode Lane; Janco Engineering Co., Ltd., off Dorridge Road, Dorridge, near Solihull.

Slough.—Magistrates' courts, county courts and fire and ambulance station; county architect, Walton Street, Aylesbury.

Spennymoor.—Houses (134) for U.D.C.; Gray and Partners, architects, Camden Street, North Shields.

Stockton-on-Tees.—Congregational Church, Yarm Road (£15,000); R. Blackett and Son, builders, Bondgate, Darlington.

Stoke-on-Trent.—Houses (2,500), to be erected next year; W. A. Bott, borough surveyor, Town Hall.

Stourbridge.—Church hall, Norton estate, for Church of St. Michaels; Robinson & Kay, architects, Stourbridge.

Swansea.—R.C. secondary school, Derwen Fawr; Cyril A. Hughes, architect, 51, Walter Road.

Wallasey.—Secondary modern school at Moreton (£91,373); borough engineer.

West Hartlepool.—Rebuilding of St. Joseph's R.C. School; T. A. Crawford, architect, 80, Borough Road, Middlesbrough.

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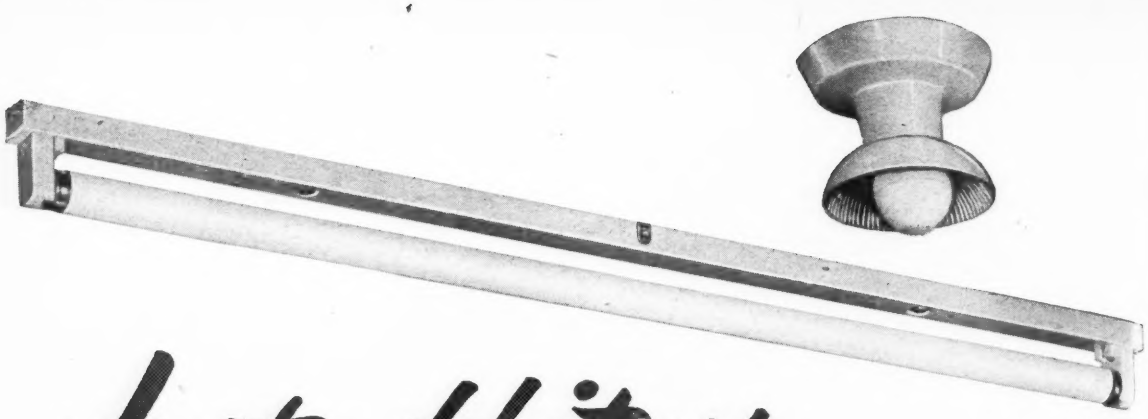

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High Specific Inductivity
Lower Power Factor
Stability
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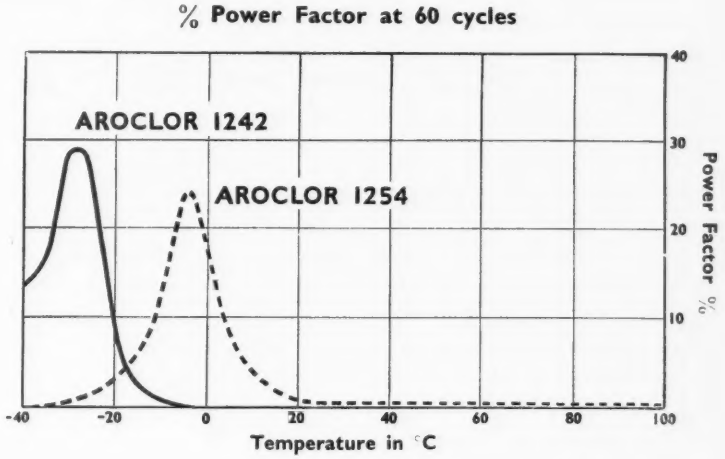
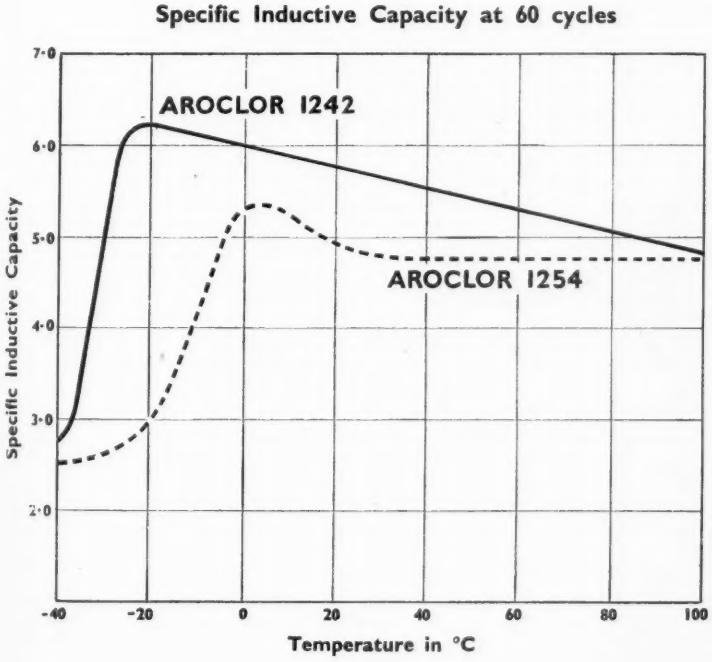
Cut costs—by cutting size





Monsanto supplies Aroclors in bulk, and in two grades: Aroclor 1254, for use in temperatures down to about —10°C; and Aroclor 1242, for use in very cold climates, particularly when operation is intermittent. The Aroclors are widely accepted as ideal capacitor impregnants and they are being applied on a large scale in the U.K. and elsewhere — over 25 million Kilovars of capacitors in the U.S.A. alone use Aroclor dielectric fluids.

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Switch Socket Outlets (complete with plugs)		
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4910	5 x 3 pin surface S.P. shuttered. Brown.	8/- each
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4920	15 x 3 pin surface S.P. shuttered. Brown.	11/4 each
4921	15 x 3 pin surface S.P. shuttered. White.	12/8 each
	Moulded Mounting Plates	
4508	For surface 5 x 3 pin socket outlet. Brown.	6/4 dozen
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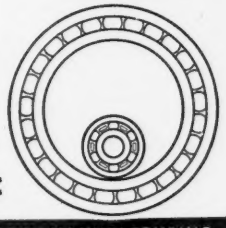
Photograph by courtesy of Marconi's Wireless Telegraph Co. Ltd., Chelmsford, Essex.



Two of the various types of Hoffmann Ball Bearings used. Actual size.

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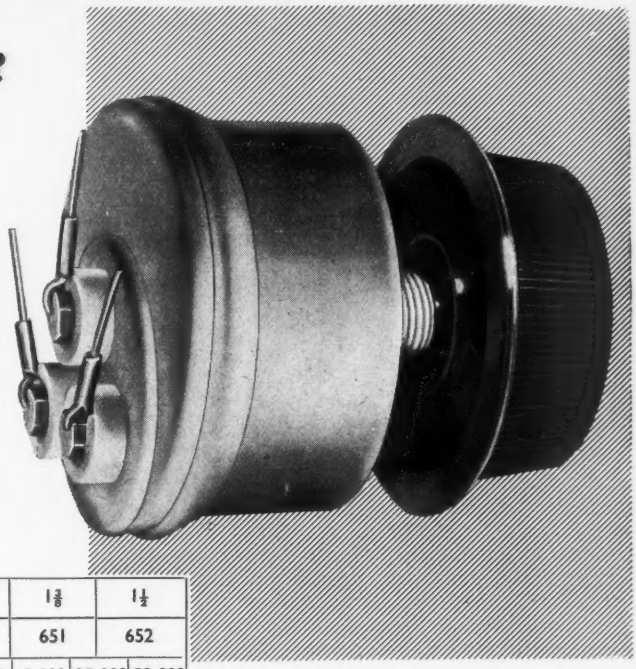

Hermetically sealed potentiometers are Type Approved to Class H.1. of RCL 121, 2.5 watt rating for use in Arctic and Tropical conditions.

Shaft Length (inches) ...				⅞		1		1⅛		1¼		1⅜		1½	
Part No.				647		648		649		650		651		652	
Ohmic value ...	5	10	25	50	100	250	500	1,000	2,500	5,000	10,000	25,000	50,000		
Current (amps.)	1	.7	.45	.32	.22	.14	.1	.07	.045	.032	.022	.014	.01		

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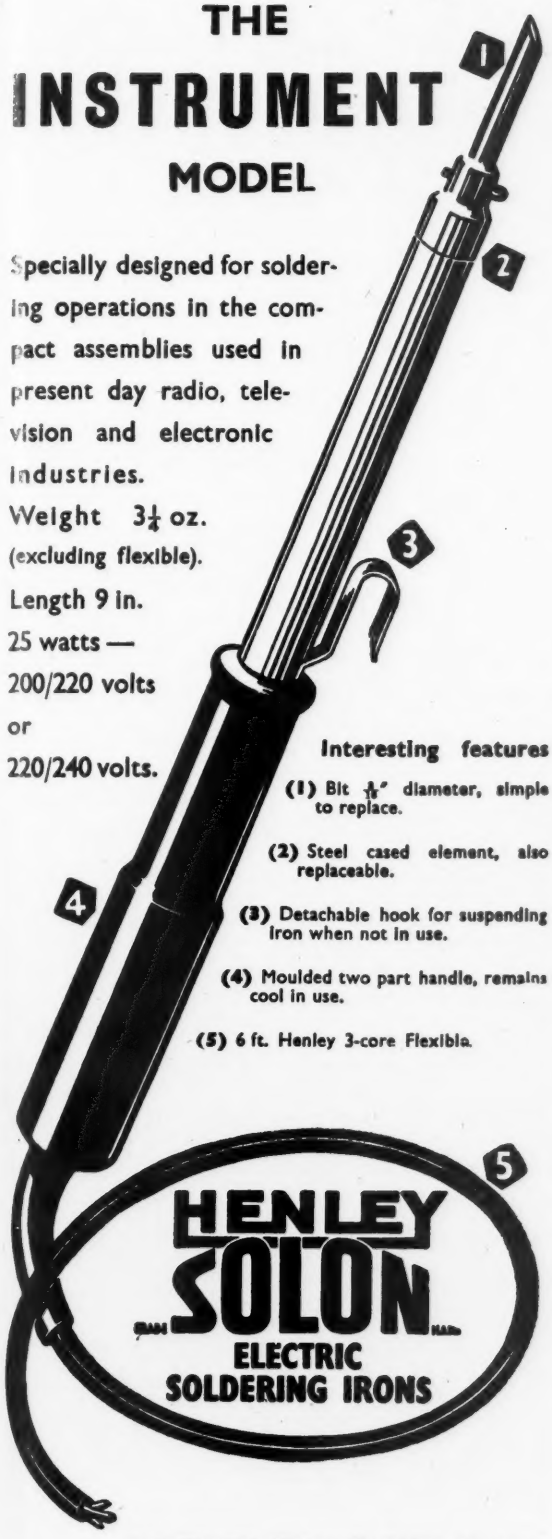
Length 9 in.

25 watts — 200/220 volts or 220/240 volts.



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(1) Bit ⅛" diameter, simple to replace.

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(4) Moulded two part handle, remains cool in use.

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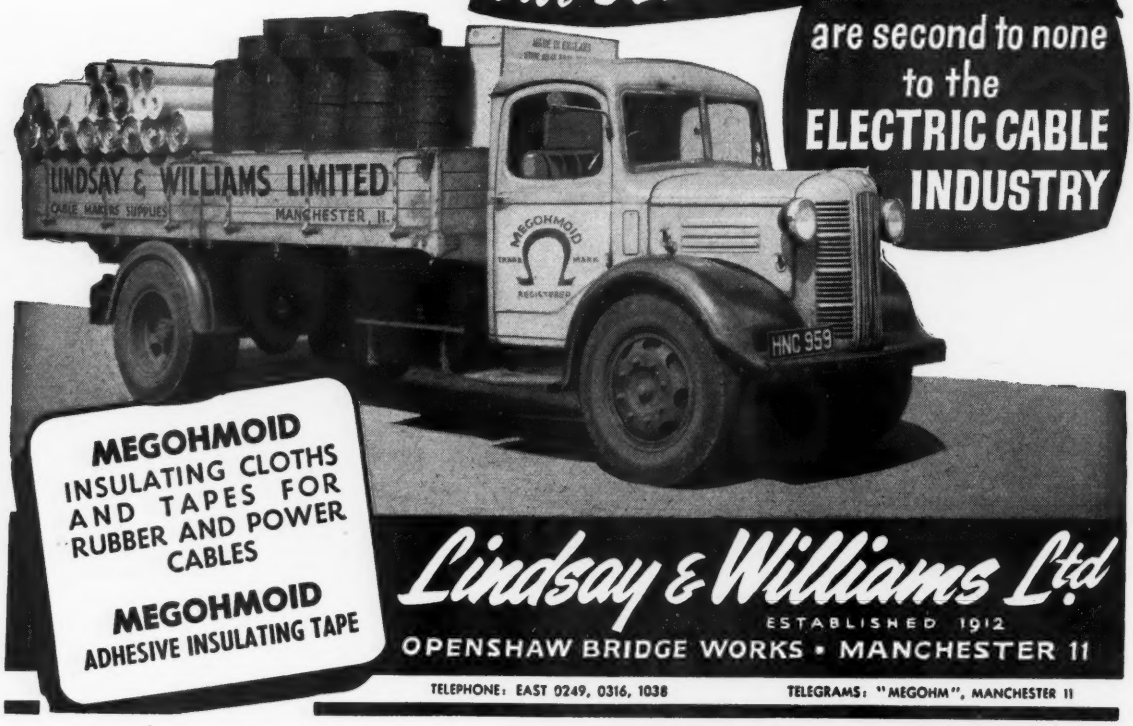

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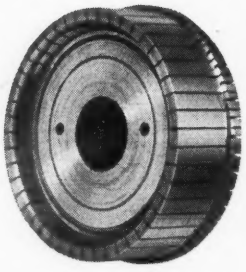

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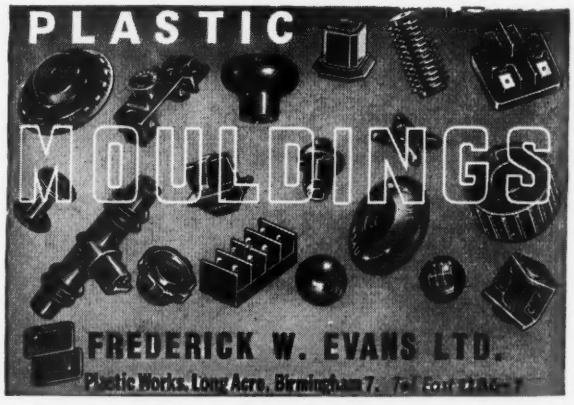

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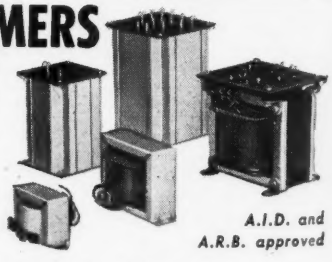

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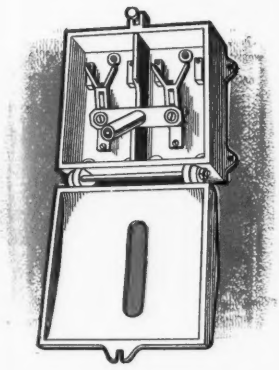

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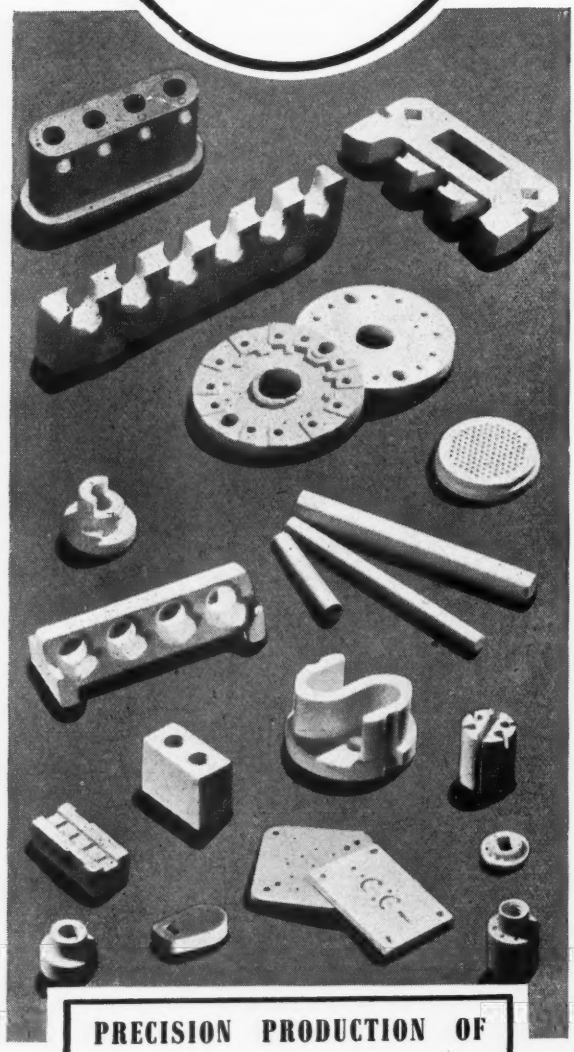

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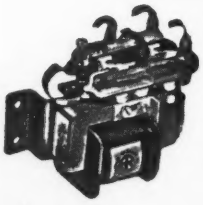

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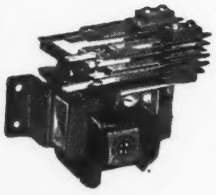

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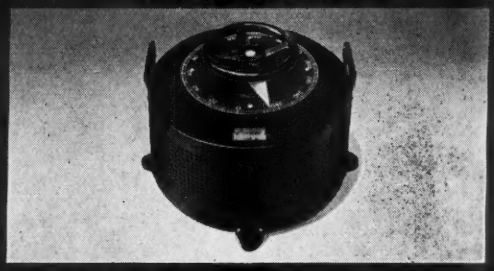

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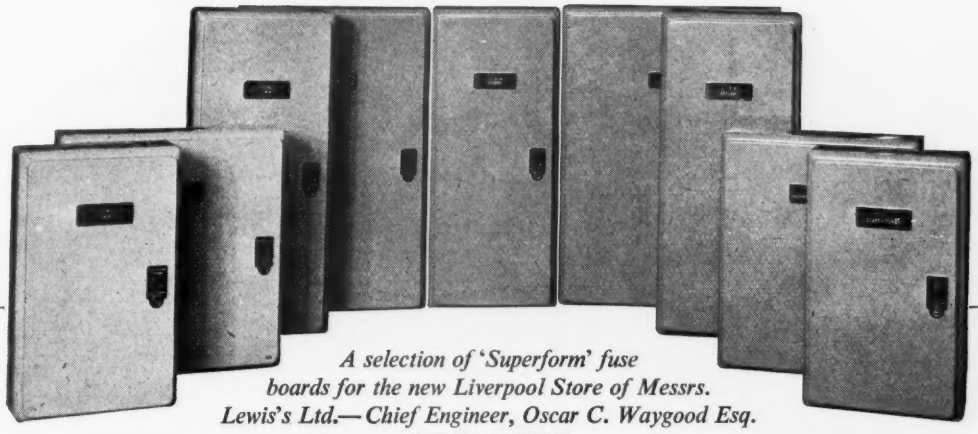

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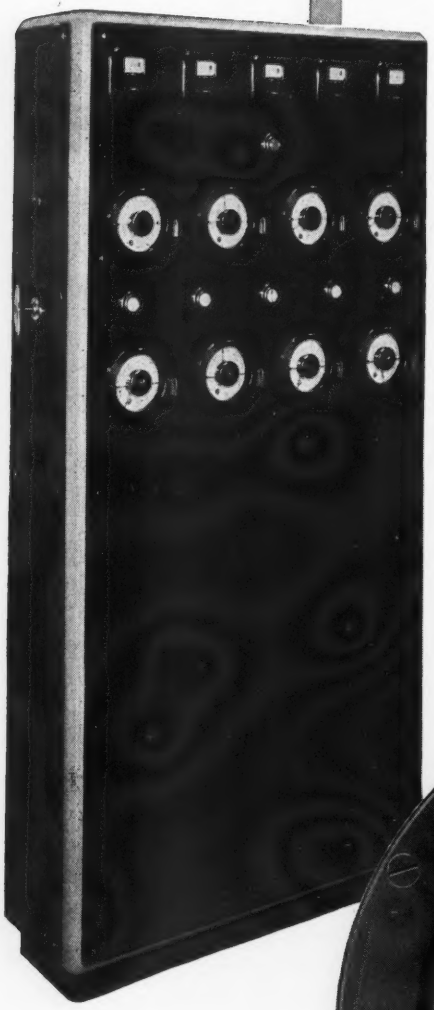

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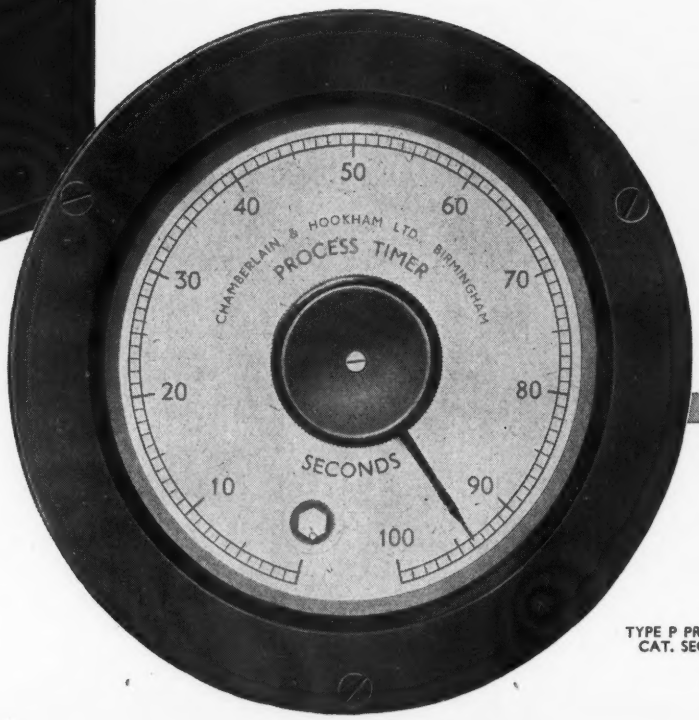

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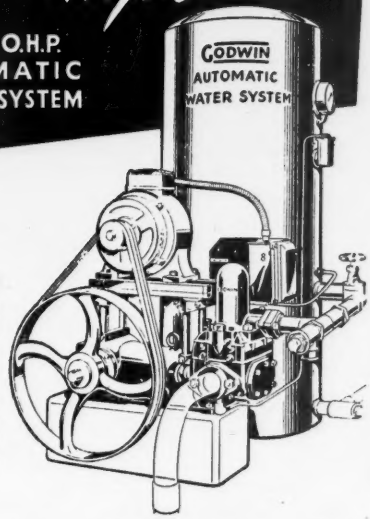

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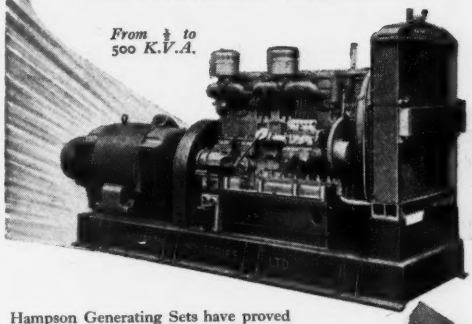
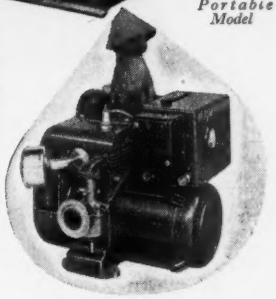


Illustrated below is the Portable Model



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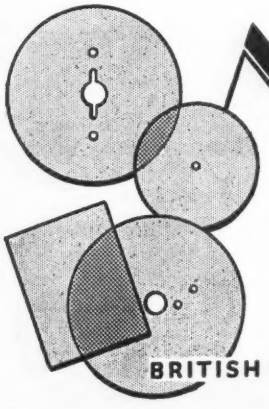

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A range of highly polished glossy Instrument knobs and dials, designed to enhance the appearance of high quality apparatus, and forming a matching group of four control knobs of identical appearance but in graded sizes. The fluted design of these components give a firm grip for accurate and delicate control. The "Silver-dials" are indelibly calibrated in black on a frosted aluminium disc. All but the smallest model can be supplied with matching moulded skirt if required.

★ ★ ★

All Bulgin Control Knobs (*with a few special exceptions*) are fitted with a heavy brass insert bush to accept 4 B.A. grub screws and to fit standard ¼" Ø shafts. This method of construction ensures that the grub-screw can be tightened to its maximum without danger of fracturing the moulding, thus ensuring perfect non-slip grip on unflatted shafts.

THE BULGIN RANGE OF CONTROL-KNOBS INCLUDES Twelve styles of pointer-knob, Two complete matching sets of instrument knobs, One complete set of five television knobs, as well as round, hexagon, shell-nosed, hand-wheel, fluted, rectangular and long push-pull types. And a matching set of no less than 9 different standard escutcheons *(and many more to quantity orders).* The normal standard colours for these knobs (usually manufactured in highly polished thermo-setting plastic, but some models are made in thermo-plastic) is black but colours are available to quantity orders. 50 designs to choose from.

★ ★ ★

FULL INFORMATION is available in New 144 page catalogue (No. 194/ER) soon to be published — Send for your copy now, Free to trade letter-head or order. Other Bulgin components are also listed ; A comprehensive guide book for anyone who deals with Electronics.

MANUFACTURERS OF RADIO AND ELECTRONIC COMPONENTS

A. F. BULGIN & CO. LTD., BARKING, ESSEX

Telephone : RIPpleway 3474 (5 lines)

THE CHOICE OF CRITICS
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A good rubber cable to work with

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ELECTRICAL EQUIPMENT

CROMPTON PARKINSON LIMITED

CROMPTON HOUSE · ALDWYCH · LONDON W.C.2

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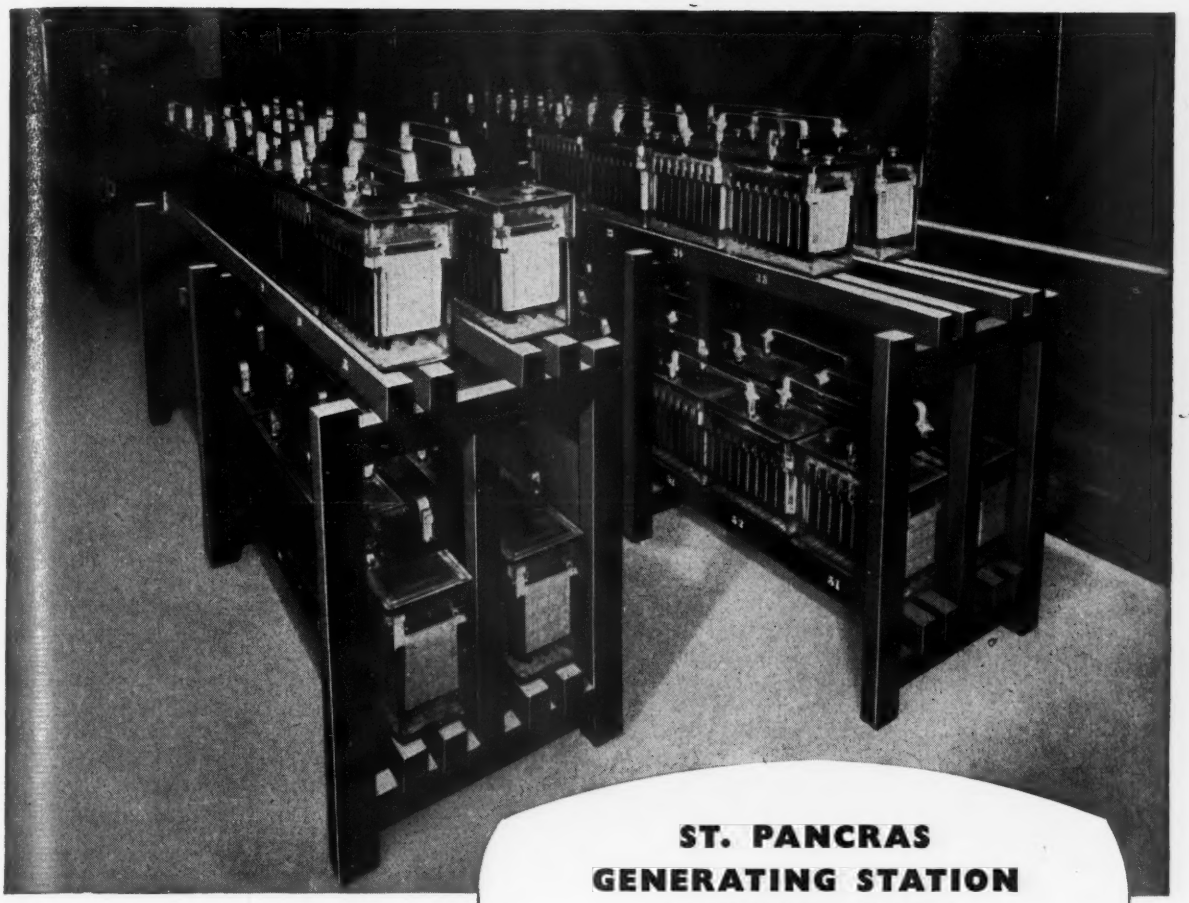

ST. PANCRAS GENERATING STATION LONDON, N.W.1

Photograph by permission of The British Electricity Authority

ABOVE is shown the installation of a 58 cell "TUNGSTONE" Battery —Enclosed Type 25G17S—200 a.h. capacity at St. Pancras Generating Station, London, N.W.1.

TUNGSTONE BATTERIES have been designed to meet Post Office and British Standard Specifications. They are being used in Power Stations and Telephone Exchanges all over the British Isles; in Australia, India, New Zealand, Egypt, West Indies, etc.

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BATTERIES

TUNGSTONE PRODUCTS LIMITED

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Works: MARKET HARBOROUGH, LEICS.

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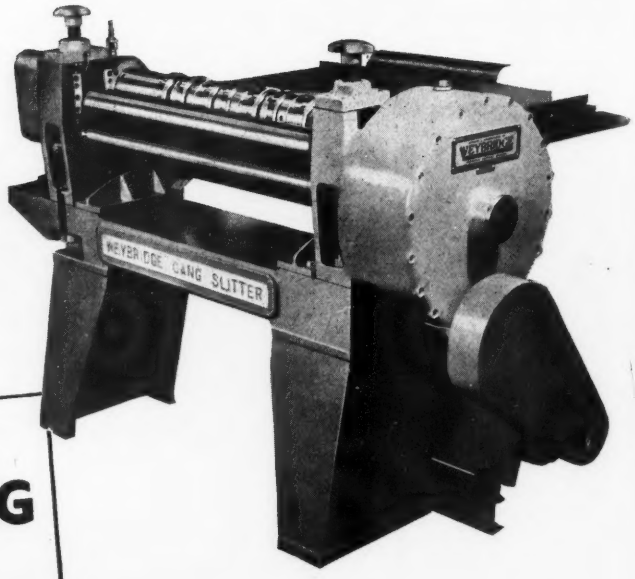
★LIGHT MODEL

For most grades of sheet steel, brass, tinplate, plastics, fibre and other materials. Standard cutting speed: 150 feet a minute; variable if required.
Maximum capacity in M.S. — 12 cuts in 22 S.W.G. With other materials the capacity depends on their nature.
Machines supplied to handle sheet widths up to 36 inches and beyond, in special circumstances, also supplied fitted with coiling equipment.



FOR HIGH SPEED
PRECISION SLITTING
OF SHEET & STRIP

Weybridge GANG SLITTERS

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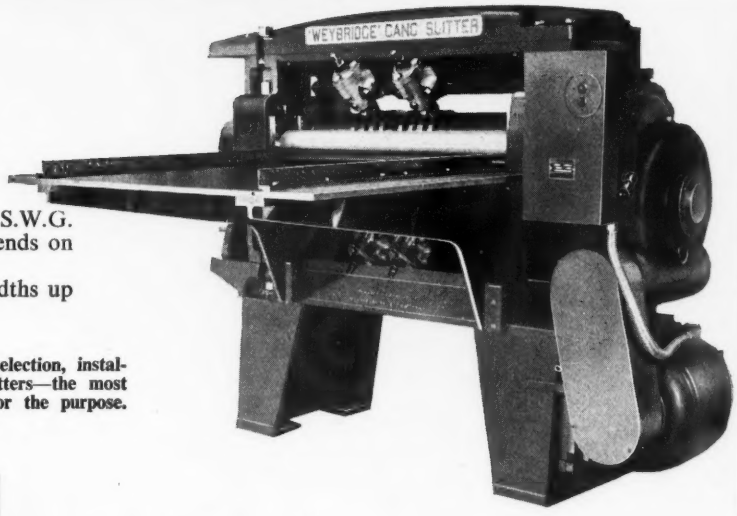
For most grades of sheet steel, brass, plastics and other materials. Standard cutting speed: 180 feet a minute; variable if required.
Maximum capacity in M.S.—6 cuts in 8 S.W.G. With other materials the capacity depends on their nature.
Machines supplied to handle sheet widths up to 7 feet.



● **Our specialists will gladly advise on the selection, installation and use of WEYBRIDGE Gang Slitters—the most efficient and reliable machine yet devised for the purpose.**

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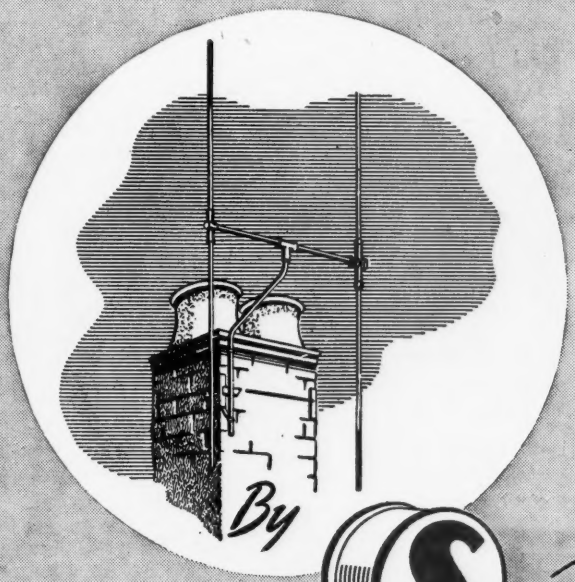
EM/Sub/M137



The connection is obvious

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By Spencer Wire

THE SPENCER WIRE CO. LTD., THORNES WIRE MILLS, WAKEFIELD, YORKS.

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Phone: Brighton 28366 Grams: Metway Phone Brighton

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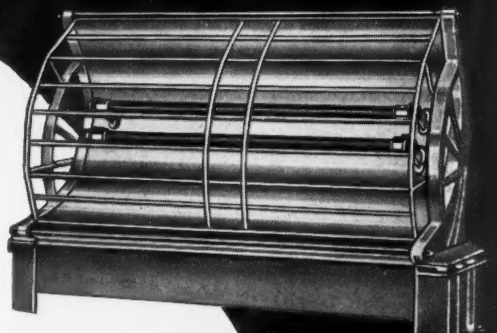

Highly polished chromium plated reflector and approved guard. Robust construction. Generous dimensions 17" wide, 11½" high, 6" deep. Excellent finish stoved cream enamel. Approved by Electricity Boards.

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Range 200/220v 230/250v

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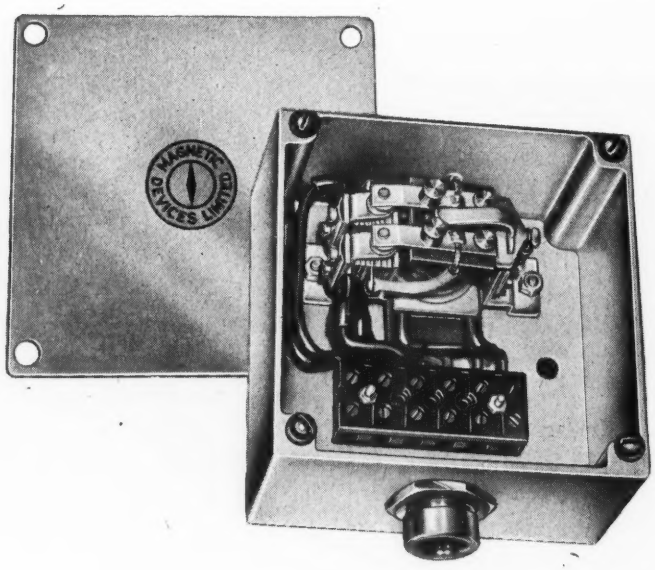
Enclosed Types

Our Relay, Types 100/105, 151/156, and 600/605 are available in diecast cases, 4" x 4" x 2". The illustration shows Type 151.



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***Easy to* INSTALL**
INSPECT
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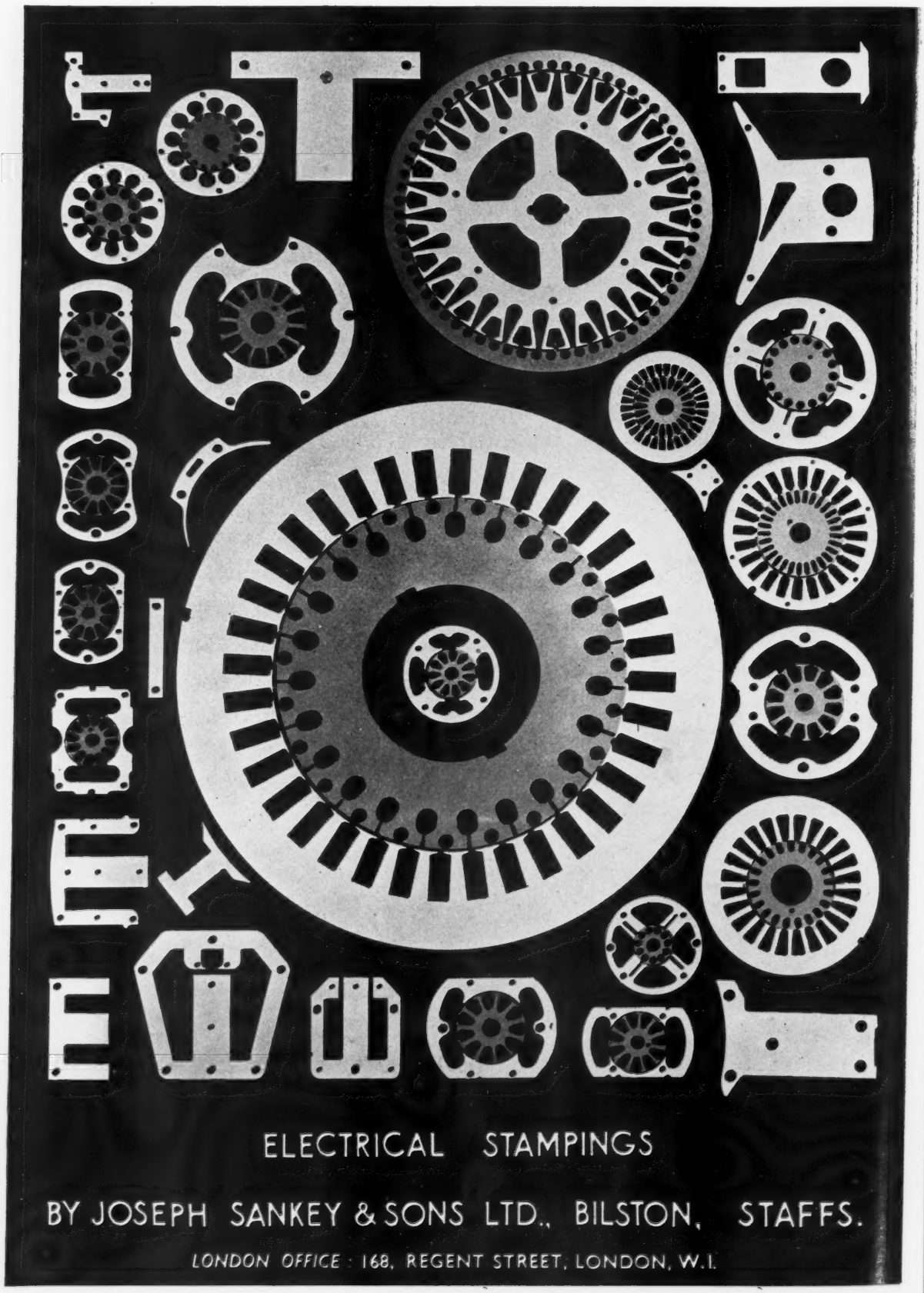
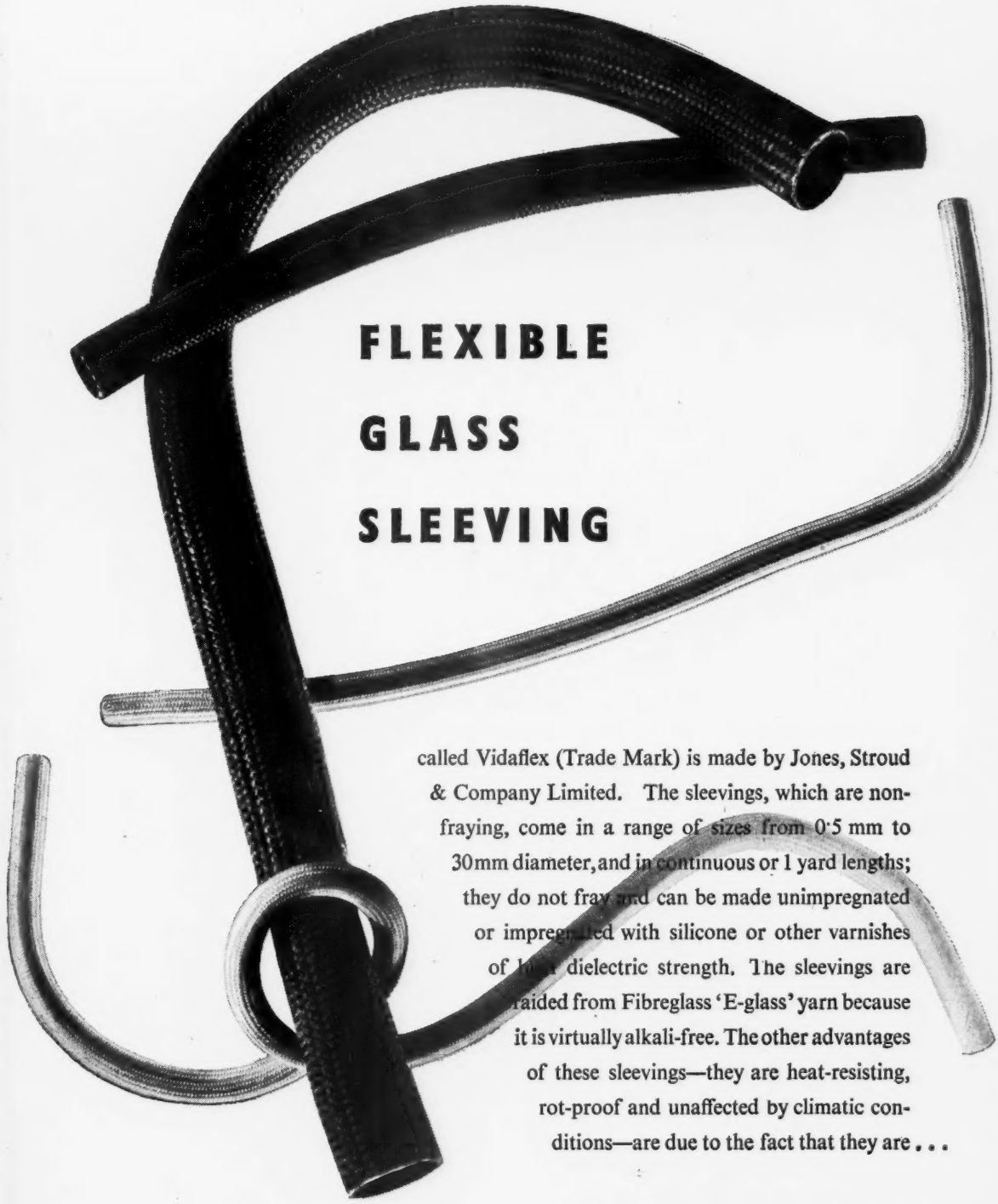

ELECTRICAL STAMPINGS
BY JOSEPH SANKEY & SONS LTD., BILSTON, STAFFS.
LONDON OFFICE : 168, REGENT STREET, LONDON, W.1.



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called Vidaflex (Trade Mark) is made by Jones, Stroud & Company Limited. The sleevings, which are non-fraying, come in a range of sizes from 0·5 mm to 30mm diameter, and in continuous or 1 yard lengths; they do not fray and can be made unimpregnated or impregnated with silicone or other varnishes of high dielectric strength. The sleevings are braided from Fibreglass 'E-glass' yarn because it is virtually alkali-free. The other advantages of these sleevings—they are heat-resisting, rot-proof and unaffected by climatic conditions—are due to the fact that they are . . .

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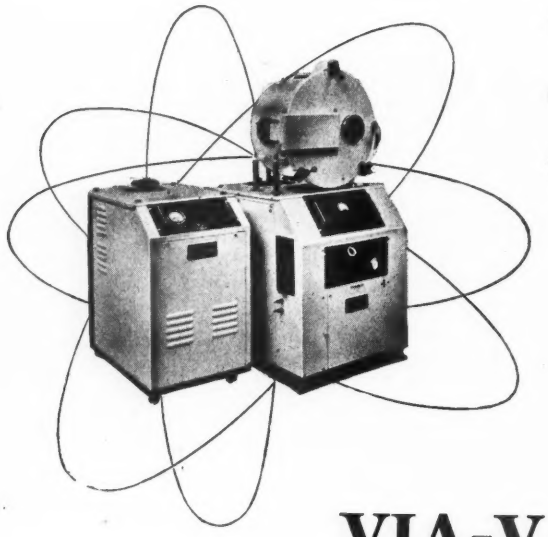
Factories at St. Helens, Lancs and Possilpark, Glasgow

V.I.A. HIGH VACUUM FURNACE

Gives scientific control of metal processing



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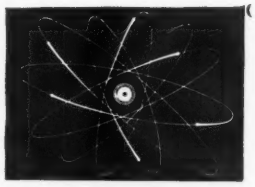

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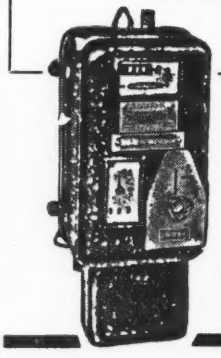

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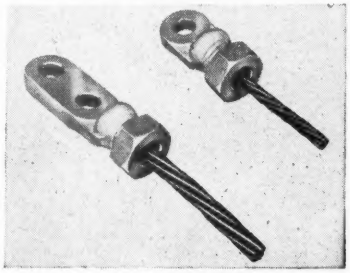
200-240 v. A.C. S/Ph 50 c. (& D.C.)
AVAILABLE FROM STOCK
POLYPHASE 400-440 v. 3-Wire Type Ex Stock

UNIVERSAL ELECTRICAL CO.
217-221 City Road, London, E.C.1



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for $\frac{1}{16}$" — $\frac{3}{4}$" cable

All types of solderless *electrical connectors* for $\frac{1}{4}$" — 3" dia.

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we offer

SEASONAL GREETINGS

& BEST WISHES FOR PROSPERITY

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INVERNESS WORKS · HOUNSLOW · MIDDLESEX

Telephone: Hounslow 0083 (8 lines) *Telegrams:* Dewhurst, Hounslow

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Two new GLASS FIBRE LAMINATES with a tremendous range of uses!

RILGLAZE "MF"
An inexpensive laminate, *fireproof*, with good mechanical properties.

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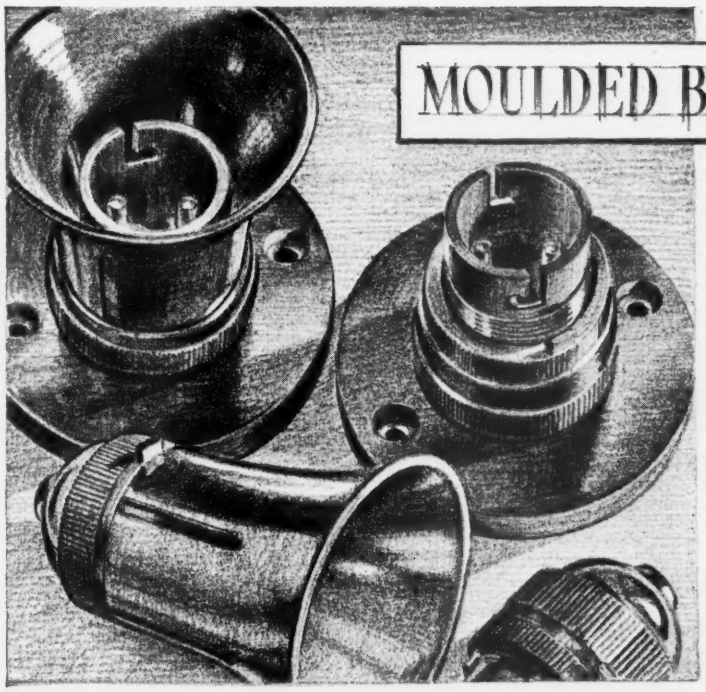

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by Sperryn TRADE MARK

A complete range of Batten, C.T.S., Skirted, Conduit, Switch and Flexible lampholders are available complying with B.S.52.

for Efficient Electrical Accessories of Quality

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—see the SLYDLOK people

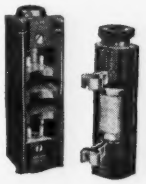
"X" SERIES VIBRATION PROOF FUSES

Five types in 5, 15, 30 and 60 amp. sizes are available to suit all requirements of wiring, connecting and mounting. Vibration proof SLYDLOK "X" type fuses are renowned for their compactness, resistance to mechanical shock, and ease of mounting and wiring. Send for leaflet EW39 which contains full specification.

DELIVERIES FROM STOCK

"G" TYPE FUSES

Vibration proof, sizes 15, 30, 60 and 100 amp. Ratings for 250/500 volts with rewireable fuse-links, or H.R.C. cartridges. Leaflet EW40, sent on request, gives full details.



EDWARD Wilcox & CO. LTD. · WYTHENSHAWE · MANCHESTER

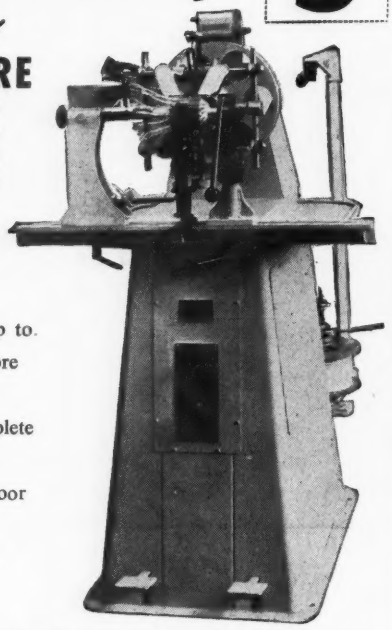
Telephone: Wythenshawe 2235/6/7 Telegrams: "Slydlox, Manchester"

LONDON: Fulwood House, Fulwood Place, W.C.1. Tel.: CHAncery 2206

dm E.W.53

"MDC LTD. Quickway" MODEL 3

ARMATURE WINDING MACHINE



Designed to wind 2 pole armatures up to 6" diameter by 6" core length. Wire size 24–16 S.W.G. Complete with turns counter tension device and floor mounting stand. Details supplied on request.

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Telephone 20172 (5 *lines*) *Grams: "DYNAMO"*

The CLIPPON UNIVERSAL HANDLAMP

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FOR MOTOR REPAIR WORK, MACHINE SHOPS, ETC. A NECESSARY ACCESSORY FOR ALL TRADES

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C. M. CHURCHOUSE LTD.
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IRONCLAD BELLS LOW and HIGH VOLTAGE A·C and D·C

LUMINOUS CALL INDICATORS FLASHING TYPE WITH BUZZER COLOURED DOME GLASSES 12 VOLT A.C. OPERATION

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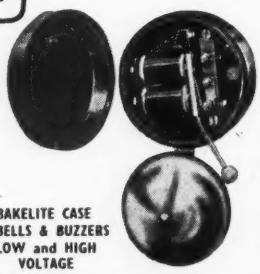
BELL TRANSFORMERS METAL CASED 5-500 WATT CONDUIT ENTRY BAKELITE CASED FOR SMALL BELL INSTALLATIONS



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Other Products include
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ELECTRIC TRUCKS

An example of first class workmanship at a price which is not prohibitive.

Strong, rugged and economical to run and maintain . . . Designed to give years of useful service.

"WRIGLEY" products include:—
1 & 3 h.p. PETROL TRUCKS
TUGS, TIPPERS, DUMPERS
FORK LIFTS, STILLAGE TRUCKS
HAND TRUCKS & TROLLEYS
TRAILERS (10 cwt. to 10 tons)

Full details on request

MODEL E.509
(illustrated)

An electrically powered truck handling loads of up to 15 cwt. with speed and ease.

The tipping body is a feature which gives it the advantage of being a dual-purpose truck adaptable for many uses in modern industry.

WESSEX INDUSTRIES (Poole) LTD
WEST STREET POOLE DORSET
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Plugging on

Twenty-three years ago, Exide Batteries led the field by introducing the plastics battery vent plugs shown on the right which we moulded in acid-resisting phenolic material. The job also entailed cementing together three parts to provide the trap to prevent escape of electrolyte. As new techniques and new materials became available, the vent plugs were redesigned and the most modern types, illustrated above, are moulded in two pieces only, using cream coloured polystyrene. Looking through our records recently, we find we have now produced several millions of these plugs, known throughout the world to users of "Exide-Ironclad" and "Chloride" batteries, and we reflect with pleasure upon yet another old friend well satisfied by Streetly Service.

MOULDED BY STREETLY

THE STREETLY MANUFACTURING CO. LTD.,

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B·I·P GROUP

Telephone: Streetly 78411.

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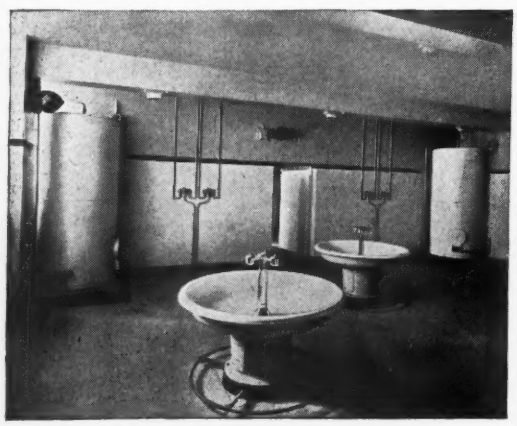
these salient facts about

G.E.C.

INDUSTRIAL electric water heaters



600 gals. 54 kW.

Two 300 gal. 27 kW. G.E.C. Water Storage Heaters installed in an ablution block of a large engineering works.

1 *no fuel storage problems*

2 *easy maintenance*

3 *no fumes or dirt*

4 *constant temperature*

5 *economy*

The G.E.C. has long specialised in industrial water heating equipment. Expert advice on equipment is readily available at all times—on application.

THE GENERAL ELECTRIC CO. LTD.
MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue (*see notice below for 24th and 31st December*), and should be addressed to Classified Advertisement Dept., Dorset House, Stamford Street, London, S.E.1.

CLASSIFIED advertisements are PREPAID at 3/- per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number this counts as two words and carries an additional charge of 1/-.

DISPLAYED:—£2 per inch, per insertion. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

Original testimonials should not be sent with applications for employment

CHRISTMAS

Classified Advertisements for the issue of 24th December have now closed for press.

Classified Advertisements for 31st December are accepted up to FIRST POST on THURSDAY, 23rd December.

OFFICIAL NOTICES, TENDERS, ETC.

WHISTON PARISH COUNCIL

Street Lighting, Liverpool-Warrington Trunk Road (A57)

THE Parish Council invite tenders for the proposed supply, erection and commissioning of sodium vapour discharge lighting units on the Liverpool/Warrington Trunk Road A57, within the Parish District, for approximately 780 yards.

The drawings and general conditions of contract may be inspected at the Liverpool City Lighting Department, 17, Highfield Street, Liverpool, 3, and copies of the special conditions of contract, specification and form of tender may be obtained from the Clerk, Whiston Parish Council, 38, Ford Road, Whiston, Prescot, Lancs, on payment of a deposit of two guineas, which will be refunded on the submission of a bona fide tender.

Tenders in a plain sealed envelope are to be addressed to the Clerk of the Council at 38, Ford Road, Whiston, not later than 16th January, 1955. The Council do not bind themselves to accept the lowest or any tender.

J. N. BEESLEY,
38, Ford Road, Clerk to the Council.
Whiston, Lancs. 6635

INDIA STORE DEPARTMENT

THE Director-General, India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, invites tenders for the supply of ELECTRONIC VALVES MAKING MACHINES AND EQUIPMENT, including Auto. Button Stem Presses, Auto. Exhaust Machines, Electronically Operated Welders, Grid Winders, Auto. Filament Spraying Machines, Stabilisation Bays, etc.

Tender schedule and specifications can be purchased from the above address at a cost of ten shillings.

Drawings mentioned in the tender schedule are on exhibition with Hodges Bennett & Co. Ltd., 59/60, Petty France, Westminster, London S.W.1, copies of which can be obtained from them against payment.

In your applications for tender forms and drawings, please quote reference S.1728/54/27/CIV.3.

Tenders complete with specifications are to be submitted by Tuesday, 22nd February, 1955. 6560

CRAWLEY PARISH COUNCIL

Lighting Equipment for A.23, London to Brighton Trunk Road

TENDERS are invited for the supply and delivery to Crawley of 18 25-ft. concrete columns and 18 5-ft. fluorescent lanterns.

Documents may be obtained from the Clerk, Robinson House, Robinson Road, Crawley, Sussex. 6575

CORPORATION OF COVENTRY

ELECTRICAL contractors invited to tender for work at Limbrick Wood Infants' School, Tile Hill. £1 1s. deposit by 23rd. December, payable to Coventry Corporation, for documents (refundable on return of documents and receipt of tender by closing date). Completed tenders by 21st January, 1955, to City Architect, Bull Yard, Coventry. 6576

CITY OF BIRMINGHAM

To Electrical Contractors

THE Welfare Committee invite separate tenders for the installation of (a) Electric Lighting and Power, and (b) one Electric Lift, at the Aged Persons' Home, Serpentine Road, Birmingham, 29.

General conditions (which include the Corporation's usual Fair Wages and Conditions of Labour Clause) may be inspected at the Mechanical and Public Lighting Department, 38, Cambridge Street, Birmingham, 1. Copies of the special conditions, specifications and plans, etc., will be forwarded on payment of £2 2s. for each contract at the office of Sir Herbert Manzoni, Chief Engineer & Surveyor, Civic Centre, Birmingham, 1, to whom all cheques should be made payable. The deposit will be returned on receipt of a bona fide tender.

Tenders, enclosed in the envelope provided for the purpose, must be sealed and delivered to the Town Clerk's Office (Room No. 12a), Council House, Birmingham, 1, not later than twelve noon on Friday, 7th January, 1955, when they will be opened. Tenders received after that time will be rejected.

The Committee do not bind themselves to accept the lowest or any tender.

J. F. GREGG,
Council House, Town Clerk.
Birmingham, 1. 6591

DURHAM COUNTY COUNCIL

Education Committee

THE Education Committee is prepared to receive sole tenders from Electrical Engineers for Electrical Installation Schemes at the following premises:—

Neville's Cross College.
Durham, Framwellgate Moor County Junior School.
Bishop Auckland Technical College—Workshop Block.
Horden Special School.
Felling Wardley County Infants' School.
Stanley (South Stanley) County Infants' School.

Applications for the forms of tender and specifications of work are to be sent to G. R. Clayton, Esq., F.R.I.B.A., County Architect, Court Lane, Durham, not later than the 31st December, 1954.

No pledge is given to accept the lowest or any tender.

J. K. HOPE,
Shire Hall, Clerk of the County Council.
Durham.
6th December, 1954. 6574

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the Local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order, 1952.

ELECTRICAL DESIGNER/DRAUGHTSMEN

with National Certificate (Electrical) standard of education and experience in the design of lighting and power layouts in large industrial plants, are required in London office of major consulting and contracting engineers to the oil and chemical industries.

Posts are permanent and carry progressive salaries with sickness, pension and life insurance benefits.

Applications in writing should be addressed to Personnel Manager, Kellogg International Corporation, 7-8, Chandos Street, London, W.1. 6642

ELECTRICAL MAINTENANCE ENGINEER

required for service with the SUDAN LIGHT & POWER CO. LTD., in Khartoum, Sudan. Basic salary on appointment within the range £E.900-£E.1,380 per annum, according to age, qualifications and experience. (£E.1 = £1 0s. 6d.)

Candidates should have had considerable experience on the maintenance of 6.6-kV and 11-kV switchgear and associated equipment for the remote control of generating sets, including relay equipment and voltage regulators of the Brown Boveri type. A knowledge of motor rewinding would be an added qualification. Preference will be given to persons having a National Certificate in Electrical Engineering, and a good general education is essential.

Duties will include responsibility for the maintenance of all electrical equipment, both main and auxiliary, in the power station, which has an installed capacity of approximately 12,500 kW of plant in the form of fourteen diesel engine generators supplying through a 6.6-kV truck type switchboard. Work is in hand on an extension to the power station to house two 5-MW steam turbine sets and an 11-kV metalclad switchboard. The candidate chosen will be required to undertake the training of Sudanese staff as part of his duties.

Appointment will be on contract by arrangement up to five years, including a period of 12 months' probation, with a bonus payable on completion of the contractual period. Free living accommodation with basic furniture or an allowance in lieu thereof will be provided. After satisfactory completion of the probationary period liberal leave on full salary with free passages. In addition to basic salary a cost-of-living allowance will be payable, and a kit allowance of £E.50 on appointment.

Applications, stating age, education, qualifications, experience (with particulars of posts held), present appointment and salary, with names of two references, should be submitted to the Secretary, The Power & Traction Finance Company Limited, Queen's House, Kingsway, London, W.C.2. 6616

BRITISH ELECTRICITY AUTHORITY

South Wales Division

APPLICATIONS are invited for the following superannuable N.J.B. appointments.

JUNIOR ENGINEERS. (Vacancy No. 117/54).

Salary of £475/£520 per annum with scope for advancement to higher operational/maintenance posts. H.N.C. or equivalent and previous manufacturing works training essential.

GENERAL ASSISTANT ENGINEERS, GENERATION (CONSTRUCTION) DEPT. (Vacancy No. 118/54).

Applicants should have a knowledge of mechanical or electrical practice in power stations. H.N.C. or equivalent qualifications desirable.

Salary AX/CX 6, £600-£765.

SENIOR DRAUGHTSMAN (ELECTRICAL). (Vacancy No. 119/54).

Salary Schedule D, Grade 5, £640-£740.

ENGINEERING DRAUGHTSMAN (ELECTRICAL).

Salary Schedule D, Grade 6, £510-£630.

Candidates should be suitably qualified and have had experience in the preparation of layouts and diagrams for the installation of power station auxiliaries, E.H.T. and L.T. switchgear, transformers and cables. Knowledge of protective gear systems advantageous.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-Fedwen Road, Gabalfa, Cardiff, to be returned by 31st December, 1954. 6673

YORKSHIRE ELECTRICITY BOARD

No. 1 (Bradford) Sub-Area

BRADFORD DISTRICT.

THIRD ASSISTANT DISTRICT ENGINEER. Applicants should have passed the Graduateship Examination of the Institution of Electrical Engineers or hold recognised equivalent technical qualifications, have substantial experience in construction, operation and maintenance of high-voltage systems, underground cables and overhead lines and substations, and medium and low-voltage networks, preferably including direct current systems.

Candidates must be prepared to reside in the district and undertake standby duties, if required.

Salary N.J.B. Class J, Grade 9, £790/£20/£850 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53, Sunbridge Road, Bradford, not later than 30th December, 1954.

No. 6 (Hull) Sub-Area

BRIDLINGTON DISTRICT.

SECOND ASSISTANT DISTRICT ENGINEER. Applicants should have sound practical experience in the operation, maintenance, planning and construction of H.V. and L.V. underground and overhead lines and substations in an extensive urban and rural area.

Preference will be given to candidates who are Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications.

The successful candidate will be required to undertake standby duties and to reside in Bridlington.

Salary N.J.B. Class D, Grade 7, £675/£15/£720 per annum.

HULL AND BRIDLINGTON DISTRICTS.

JUNIOR ENGINEERS. Applicants should hold the Higher National Certificate in Electrical Engineering or equivalent qualifications, and have had training in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems.

The successful candidates will be required to reside in the district to which they are appointed, and may be required to carry out standby duty.

Hull District (Hull)):

Salary N.J.B. Class J, Grade 17, £475/£15/£520 per annum.

Bridlington District (Driffield):

Salary N.J.B. Class D, Grade 12, £475/£15/£520 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Kingston-upon-Hull, not later than 30th December, 1954.

No. 5 (Wakefield) Sub-Area

CASTLEFORD, BARNSLEY, WAKEFIELD & DONCASTER DISTRICTS.

GENERAL ASSISTANT DISTRICT ENGINEER. Applicants must have had a sound practical training with experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Applicants must hold a current driving licence, be prepared to reside in the district, and undertake standby duties.

Applicants must hold at least a Higher National Certificate in Electrical Engineering.

Salary N.J.B. Class F, Grade 11, £595/£15/£640 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 30th December, 1954.

No. 7 (Grimsby) Sub-Area

SCUNTHORPE DISTRICT.

JUNIOR ENGINEER. Applicants should hold the Higher National Certificate in Electrical Engineering or an equivalent qualification, and have had training and experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems.

Salary N.J.B. Class F, Grade 14, £475/£15/£520 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than 30th December, 1954.

No. 4 (Leeds) Sub-Area

JUNIOR ENGINEER (COMMERCIAL). Applicants should have had a sound technical and practical training and be competent to advise consumers in all matters regarding the utilisation of electricity. They should be familiar with the I.E.E. and Supply Regulations and be in possession of the Higher National Certificate in Electrical Engineering or an equivalent qualification.

Salary N.J.B. Class J, Grade 17, £475/£15/£520 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, near Leeds, not later than 30th December, 1954. 6612

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER (SALES SUPERINTENDENT), WEST DISTRICT (STRETFORD). The successful applicant will be required to assist the District Commercial Engineer in all normal sales activities. He will be responsible for supervising the organisation of service centres, exhibitions and publicity and the work of outdoor and indoor sales personnel.

Preference will be given to applicants who are Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications.

Salary scale £755 × £15 to £800 p.a., Grade F.7, N.J.B. conditions.

APPOINTMENT OF ENGINEERING DRAUGHTSMAN (ELECTRICAL), SUB-AREA TECHNICAL ENGINEER'S DEPT., MANCHESTER. Applicants should have had a good technical training and drawing office experience in the electrical design layout and detailing of indoor and outdoor substations up to and including 33,000 volts, together with the preparation of protective system schematic and wiring diagrams.

Salary within the range £510 × £20 to £630 p.a. according to qualifications and experience. Schedule D, Grade 6, N.J.B. conditions.

Applications for the above posts to Sub-Area Secretary, No. 1 Sub-Area, North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, by 29th December, 1954.

APPOINTMENT OF SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER (SALES SUPERINTENDENT), CHORLEY. The successful applicant will be required to assist the District Commercial Engineer in all normal sales activities. He will be responsible for supervising the organisation of service centres, exhibitions and publicity and the work of outdoor and indoor sales personnel.

Preference will be given to applicants who are Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications.

Salary scale £755 × £15 to £800 p.a., Grade F.7, N.J.B. conditions.

Applications to the Manager, No. 4 Sub-Area, North Western Electricity Board, 40/41, Lune Street, Preston, by 29th December, 1954.

APPOINTMENT OF THIRD ASSISTANT DISTRICT ENGINEER, BLACKBURN DISTRICT. The successful candidate will be required to assist in the operation, maintenance and construction of underground and overhead mains, substations and transformers, and to undertake general mains standby duties.

Preference given to candidates who are Graduate Members of the Institution of Electrical Engineers, or who possess the H.N.C. in Electrical Engineering.

Salary scale £715 × £15 to £760 p.a., Grade G.9, N.J.B. conditions.

Applications to Sub-Area Manager, North Western Electricity Board, Jubilee Street, Blackburn, by 29th December, 1954.

APPOINTMENT OF SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER, PENRITH DISTRICT. Duties will be to assist the District Commercial Engineer in dealing with consumers' requirements and enquiries on all matters, including sale and installation of apparatus, repairs and maintenance, emergency service and tariffs, new supplies and development in urban and rural areas, control of workshops and service centres, and preparation of specifications and estimates.

Salary scale £675 × £15 to £720 p.a., Grade D.7, N.J.B. conditions.

Applications to Sub-Area Manager, No. 6 Sub-Area, North Western Electricity Board, Castle Green, Kendal, by 29th December, 1954.

APPOINTMENT OF THIRD ASSISTANT DISTRICT ENGINEER, NEW MILLS. Applicants should have had experience in operation and maintenance of underground and overhead networks, estimating of schemes, supervising installation of short services, preliminary surveying and assisting in routine overhead lines and preparing profiles.

Salary scale £635 × £15 to £680 p.a., Grade E.9, N.J.B. conditions.

Application forms can be obtained from the Sub-Area Manager, No. 7 Sub-Area, North Western Electricity Board, Chapel Street, Hazel Grove, Cheshire, and must be returned to him by 29th December, 1954. 6578

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following vacancies:—

Fens Sub-Area

SERVICE CENTRE SUPERVISOR, PETERBOROUGH. (178/54.R.).

Candidates should be capable of taking charge of service centre, controlling all staff employed therein and handling consumers' enquiries efficiently. They should have had extensive sales and consumer service experience, and possess a thorough knowledge of appliances and their uses, contracting and the application of standard tariffs. The possession of a recognised professional qualification would be an advantage.

Salary will be in accordance with Grade 5 (£670 × £20 to £730) of the National Joint Council Salary Agreement, commencing at a point dependent upon the successful candidate's experience and ability.

Apply to the Manager, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge.

Northmet Sub-Area

GENERAL ASSISTANT ENGINEERS. (i) Harrow District (Ref. 511) (179/54.R.). (ii) Edmonton District (Ref. 513) (180/54.R).

Candidates should have had a sound technical training and experience in the construction, operation and maintenance of H.V. and L.V. distribution systems, including substations.

Salary for both appointments will be in accordance with Class F, Grade 11 of the National Joint Board Salary Agreement, commencing at £595 plus London allowance.

Apply as follows:—

(i) The District Manager, Eastern Electricity Board, 4, College Road, Harrow, Middlesex.

(ii) The District Manager, Eastern Electricity Board, 305, Fore Street, Edmonton, London, N.9.

Future salaries and conditions of service for all these appointment will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter stating age, education, qualifications and experience, with details of present appointment and salary, should be submitted to the Manager concerned within 14 days of the appearance of this advertisement. 6672

TRANSFORMER DRAUGHTSMAN required for factory in Bridgend, Glamorgan. Experience in transformers up to 2,000 kVA, 33 kV, essential. Holidays with pay. Pension scheme. A new three-bedroomed house 2 miles from factory, 5 miles from Porthcawl, available for successful applicant. Apply — London Transformer Products Limited, L.T.P. Works, Cobbold Estate, Cobbold Road, Willesden, London, N.W.10. 6455

BRITISH ELECTRICITY AUTHORITY

are expanding their GENERATION OPERATION BRANCH and require the following staff for the undermentioned sections:—

A. TECHNICAL STATISTICS SECTION. The work of the section involves the preparation of reports on the various aspects of the operation of power stations, the detailed investigation of statistical data, the design and organisation of records (with the co-operation of an existing Hollerith section), and the preparation of regular returns and reviews of power station operation.

(i) SECOND ASSISTANT ENGINEER. Salary N.J.B. Grade 2, £971-£1,325 p.a. inclusive.

To be responsible for the general supervision of a subsection dealing with plant particulars, thermal efficiency and other technical statistics, generating plant availability and staffing arrangements at power stations. Candidates should have wide experience in the preparation of reports on technical subjects and in the supervision of a statistical section. Experience of generating station operation would be an advantage.

(ii) THIRD ASSISTANT ENGINEER. Salary N.J.B. Grade 3, £908-£1,125 p.a. inclusive.

To be responsible for matters concerning the availability of generating plant and related matters. The work involves the keeping of records, the compilation of regular summaries, reports and reviews, and the preparation of reports as required.

B. OPERATIONAL RESEARCH SECTION. The work of this section involves application of operational research techniques to the engineering work of the Authority with particular reference to the examination and analysis of the performance of plant and the study of methods of improving the economy and efficiency of operation.

(iii) PRINCIPAL ASSISTANT ENGINEER. Salary, provisionally N.J.M., Scale 4, £1,650-£1,800 p.a. inclusive.

To take charge of the operational research section.

(iv) SENIOR ASSISTANT (Mathematical Statistician). Salary N.J.C. Grade 6, £767-£845 p.a. inclusive.

Applicants for post (iii) should preferably be fully qualified engineers. Previous experience on operational research is desirable. A detailed knowledge of mathematics and statistical techniques would also be an advantage. For post (iv) a mathematical degree is necessary.

Applications in writing, stating age, qualifications, experience and present position and salary, to D. Moffat, Director of Establishments, Winsley Street, London, W.1, by 22nd December, 1954. Quote ref. ER/546. 6593

ELECTRICAL AND MECHANICAL ENGINEERS

SUNVIC CONTROLS LTD. (a subsidiary of Metropolitan-Vickers Electrical Co. Ltd.) have the following vacancies in their new Development and Production Units at Harlow.

(1) GRADUATE ENGINEER with general works training and experience on the design of domestic control equipment. Applicants must be familiar with modern methods of manufacture and have some knowledge of mass production techniques.

(2) GRADUATE ENGINEER with experience in design or development of electro-mechanical mechanisms and their application to instrument problems.

The above positions are permanent and offer excellent prospects for promotion in a team engaged on the development and manufacture of a wide range of new instruments. Salaries will be according to age and ability. The company's contributory pension scheme applies in all cases, and housing is available if required.

Reply in writing, giving full particulars of age, experience, qualifications and present situation, to Chief Engineer, Sunvic Controls Ltd., Harlow, Essex. 230

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule A or C. Salary includes London allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. for posts (a) and Corporate Membership for posts (b) an advantage.

(b) SHIFT CHARGE ENGINEER, BANKSIDE GENERATING STATION (Vacancy No. 54/1034). Practical experience in operation of power station essential, with experience of high-pressure plant an advantage. Character and ability to deal with staff problems essential. Salary Class H, Grade 7 = £882 p.a.

(a) ASSISTANT ENGINEER (SHIFT), BARKING A & B GENERATING STATION (Vacancy No. 54/1035). Experience in operation of E.H.T. switchgear, station auxiliaries and control of large turbo-alternators an advantage. Duties of successful applicant will be those of Second Assistant to Station Shift Control Engineer in charge of control room. Salary Class L, Grade 14 = £708 15s. p.a.

(a) JUNIOR ENGINEER, HACKNEY GENERATING STATION (Vacancy No. 54/1036). General duties within station. Salary Class H, Grade 16 = £500 p.a.

(a) ASSISTANT ENGINEERS (CONTROL), HACKNEY GENERATING STATION (Vacancy No. 54/1037). Applicants will be expected to undertake control room duties in the "A" station control, with responsibility for synchronising, load control, and the necessary switching operations. Salary Class H, Grade 12 = £666 15s. p.a.

(a) STATION SHIFT CONTROL ENGINEER, WIMBLEDON GENERATING STATION (Vacancy No. 54/1038). Applicants should have a sound technical education and experience in the operation of turbo-generators and control room duties. Salary Class E, Grade 10 = £624 15s. p.a.

(b) SECOND ASSISTANT ENGINEER (EFFICIENCY AND TESTING), CHIEF GENERATION ENGINEER'S (G) DEPT. (Vacancy No. 54/1039). Candidates should have a sound technical education and considerable experience in testing and investigational work on boilers, turbines and dust collecting plant. Successful candidate required for investigational work in London Division. Salary Class AX/EX, Grade 2 = £997 10s. to £1,245 per annum.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, British Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland Street, London, W.1, and be received within 14 days of this advertisement.

Vacancy No. 54/1012 (last week's issue) for Shift Charge Engineer, Deptford East. Salary should read Class K, Grade 7 = £1,023 15s. per annum. 6632

UGANDA ELECTRICITY BOARD

APPLICATIONS are invited for permanent posts overseas as ASSISTANT ELECTRICAL ENGINEERS to meet the growth of the Board's system.

Applicants for all appointments should be Corporate Members of the Institution of Electrical Engineers or have technical qualifications leading to that status. Posts are vacant for those with considerable experience and for those with less, and, in the latter case, graduates and students would be eligible.

Salaries according to age and experience will be in the scale £990 × £30 to £1,260 per annum.

Uganda has a pleasant climate, income tax is moderate, and the salaries, which have just been revised, are very reasonable in relation to the cost of living. Free passages, partly furnished accommodation, medical and dental treatment. Vacation leave on full pay after three years' service.

Application forms and further information may be obtained from the London Representative, Uganda Electricity Board, 27, Regent Street, London, S.W.1.

Closing date for applications 31st December, 1954.

C. R. WESTLAKE,
Chairman. 6615

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments, which are superannuable and subject to medical examination, in the Board's No. 4 Sub-Area:—

(a) DISTRICT ENGINEER in the Runcorn District. Salary £1,035/£1,125 per annum (N.J.B. F/2). Applicants should be chartered electrical engineers and have had considerable experience in the operation and maintenance of networks up to 33 kV in an industrial area.

(b) THIRD ASSISTANT ENGINEER (CONSTRUCTION) at the No. 2 Sub-Area Headquarters, Sandiway House, near Northwich. Salary £790/£850 per annum (N.J.B. K/10). Applicants should have had experience in overhead and underground distribution work.

(c) GENERAL ASSISTANT ENGINEER (PLANNING) at the No. 2 Sub-Area Headquarters, Sandiway House, near Northwich. Salary £675/£720 per annum (N.J.B. K/13). Applicants should have had experience in overhead and underground distribution work.

(d) ASSISTANT SECTION ENGINEER in the Runcorn District. Salary £675/£720 per annum (N.J.B. F/9). Applicants should have had experience in H.T. and L.T. overhead and underground distribution work.

(e) COMMERCIAL ASSISTANT (TECHNICAL) in the Runcorn District. Salary £595/£640 per annum (N.J.B. F/11). Applicants must have had an engineering training. The duties will be to advise consumers on supply, tariffs and installation matters.

Applicants for posts (b), (c), (d) and (e) should preferably have the qualifications necessary to enable them to become chartered electrical engineers.

(f) DRAWING OFFICE ASSISTANT (Male) in the Warrington District. Salary within range £170/£395 per annum according to age, rising subject to satisfactory and competent service to £470 per annum. Applicants should be in possession of the General Certificate of Education, and preferably have had previous drawing office experience.

Application forms for all posts are available from the Manager, No. 2 Sub-Area, Sandiway House, near Northwich, Cheshire.

Closing date 28th December, 1954. 6594

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following positions within the Division:—

JUNIOR ENGINEERS, FREEMEN'S MEADOW POWER STATION, LEICESTER (Vacancy No. 185/54/ER.). Some experience in control room and boiler house work in a large P.F. station is required. Technical qualifications up to H.N.C.

Salary in accordance with Class H, Grade 16 (£475 × £15 to £520 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 23rd December, 1954.

SHIFT CHARGE ENGINEER, AVON POWER STATION, WARWICK (Vacancy No. 186/54/ER.). Applicants should be suitably qualified and have had experience in the operation of modern boiler and turbine plant.

Salary in accordance with Class E, Grade 7 (£715 × £15 to £760 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 30th December, 1954.

These appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form A.E.6/ACT, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller.

10th December, 1954. 6640

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments, which are superannuable and subject to medical examination, in the Board's No. 4 Sub-Area:—

(a) SECTION ENGINEER based on Newtown. Salary £715/£760 per annum (N.J.B. E/7).

(b) SECTION ENGINEER based on Welshpool. Salary £715/£760 per annum (N.J.B. E/7).

Applicants for posts (a) and (b) should have had experience in all branches of work associated with design, construction and operation of E.H.T., H.T. and L.T. overhead and underground distribution systems, including indoor and outdoor substation equipment.

(c) ASSISTANT SECTION ENGINEER based on Welshpool. Salary £635/£680 per annum (N.J.B. E/9).

(d) ASSISTANT SECTION ENGINEER based on Oswestry. Salary £635/£680 per annum (N.J.B. E/9).

Applicants for posts (c) and (d) should have had experience of H.V. and M.V. overhead and underground distribution work.

(e) GENERAL ASSISTANT ENGINEER (CONSTRUCTION) based on Llandudno Junction. Salary £675/£720 per annum (N.J.B. J/12).

Applicants should have had experience in the laying out, erecting and setting to work of overhead and underground mains, mainly in rural areas, and the control of gangs engaged on such work.

(f) GENERAL ASSISTANT ENGINEER in the Technical Section based on Legacy, near Wrexham. Salary £635/£680 per annum (N.J.B. J/13).

Applicants should have had experience of all forms of electrical metering and metering equipment, including installation.

Applicants for all posts should preferably have the qualifications necessary to enable them to become chartered electrical engineers.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham.

Closing date 28th December, 1954. 6595

AIRCRAFT ELECTRICAL INSTALLATIONS

THE BRISTOL AEROPLANE COMPANY Limited at Filton requires to recruit the following staff into the Electrical Section of their Aircraft Design Office:—

(a) AIRCRAFT ELECTRICAL DESIGN ENGINEERS, who have a degree in electrical engineering or equivalent qualifications and experience in the design of aircraft electrical components and installations.

(b) ELECTRICAL LAYOUT & CIRCUIT DRAUGHTSMEN, who have the H.N.C. or O.N.C. in Electrical Engineering, or the equivalent City and Guild's qualifications, or who have served an apprenticeship in electrical engineering.

Selected draughtsmen without experience of aircraft electrical design work will be considered for training.

Applications, giving details of experience, qualifications and salary required, quoting D.O.29, should be addressed to the Personnel Manager, The Bristol Aeroplane Co. Ltd., Aircraft Division, Filton House, Bristol. 6582

BRITISH ELECTRICITY AUTHORITY

North West, Merseyside and North Wales Division

VACANCY No. 242/54/R: STATION SHIFT CONTROL ENGINEER, Wigan Generating Station. Salary £555 × £15 to £600 (D.10). Closing date 27th Dec.

Vacancy No. 244/54/R: STATION CHEMIST, Carlisle Generating Station. Salary £755 × £15 to £800 (F.7). Closing date 5th Jan.

Applications, quoting vacancy number, to Controller, British Electricity House, 825, Wilmslow Road, Manchester, 20. 6639

SOUTHERN ELECTRICITY BOARD

Installation Engineer

SWINDON District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class F, Grade 8, Column 1 (£715 × £15 to £760 per annum). N.J.B. conditions of service.

Applicants should be qualified to accept responsibility for all installation and maintenance work in the district and branches and to collaborate with the development engineer and district commercial engineer in the preparation of estimates for contracting work, particularly those of an exceptional nature. The duties will also extend to branches.

The successful candidate will be required to contribute to the B.E.A. and Area Boards Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him in envelopes suitably endorsed, not later than 31st December, 1954.

Demonstrator

Swindon District of No. 2 (Newbury) Sub-Area. Salary N.J.C. Grade 1 (£400-£490 per annum). N.J.C. conditions of service.

Applicants should be women who are qualified to advise generally on the utilisation of electric domestic appliances, to give public demonstrations of apparatus and to assist in showroom duties. The possession of an E.A.W. Certificate or equivalent Domestic Science qualification would be an advantage.

The successful candidate will be required to contribute to the B.E.A. and Area Boards Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him in envelopes suitably endorsed, not later than 31st December, 1954. 6641

CAREERS IN RAILWAY SIGNALLING

LONDON TRANSPORT has vacancies in the Signal Department for suitable young men.

Modern developments and expansion now taking place in railway signalling offer interesting work with excellent prospects to the right type of entrant.

Suitable candidates will be engaged as trainees and given a three months' training followed by a qualifying examination. Successful students will be engaged in the preparation of circuit diagrams and other drawings for signalling works.

The qualification required is an Ordinary National Certificate in Electrical Engineering.

No drawing office or railway experience required.

The rate of pay during training and afterwards varies from £300 per annum at 18 years of age to £590 per annum at 30, with variations dependent upon qualifications.

Thirty-eight hour week.

Certain travel facilities are provided.

The headquarters is at Earl's Court

Write to—

The Signal Engineer
LONDON TRANSPORT
Earl's Court, Station, London, S.W.5
6562

ELECTRICAL ENGINEER-DRAUGHTSMAN URGENTLY REQUIRED

ASSISTANT ENGINEER-DRAUGHTSMAN, preferably with some experience of battery-electric traction units, D.C. switchgear, etc., required in design office of well-known manufacturers of fork lift trucks and battery electric vehicles.

Apply in confidence, giving full details of experience, qualifications, and salary required, to:

Chief Designer,
AUSTIN CROMPTON PARKINSON ELECTRIC VEHICLES LIMITED,
Webb Lane, Birmingham, 28. 224

SOUTH EASTERN ELECTRICITY BOARD

THIRD ASSISTANT DISTRICT ENGINEER, Lewes District. Salary £595-£640 p.a. under N.J.B. Class D, Grade 9. Superannuable. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems, preferably up to 33 kV. Experience of DC/AC change-over an advantage.

Applications, naming 2 referees, to G. R. Lincoln, A.I.E.E., SEEBoard, 80/81, High St., Lewes, Sussex, by 29th December, 1954.

SHOWROOM SUPERVISOR (Male), Central Sussex District. Salary £605 × £20 to £665 p.a. under N.J.C. Grade 4. Superannuable. Applicants should possess a sound knowledge of electrical appliances and tariffs and be experienced in all branches of showroom work.

Applications, naming 2 referees, to Arthur Barnes, M.I.E.E., Central Sussex District Manager, SEEBoard, Electra House, Church Road, Haywards Heath, by 29th December, 1954.

ASSISTANT DISTRICT ENGINEER, Ashford District. Salary £515 × £15 to £560 p.a. under N.J.B. Class D, Grade 11. Superannuable. Applicants should have technical training and practical experience in the construction, operation and maintenance of underground and overhead distribution systems. The position will entail standby duties.

Applications, naming 2 referees, to D. B. R. Roberts, A.I.E.E., Ashford Manager, SEEBoard, Victoria Road, Ashford, Kent, by 29th December, 1954.

A. L. BURNELL,
Secretary. 6637

AIR MINISTRY

MECHANICAL AND ELECTRICAL ENGINEERS required in Works Department for design, operation and maintenance of mechanical and electrical services on R.A.F. stations at home and overseas and Civil Aviation stations.

Appointments in two grades (a) Main Grade, salary scale £1,080 to £1,426; (b) Assistant Grade, £702 to £1,080. Starting pay according to qualifications and experience. Salaries somewhat lower in Provinces. Candidates should be age 25 or over. Appointments temporary and non-pensionable but with long-term possibilities. Special allowance up to £1,500 a year according to location payable in addition to salary during overseas service. Candidates must be natural-born British subjects of natural-born British parents.

Minimum qualifications and experience for both grades of posts: (i) (a) University degree or equivalent diploma in electrical and/or mechanical engineering and at least a two-year apprenticeship, or (b) Graduate or Corporate Membership of the Institutions of Mechanical or Electrical Engineers, with appreciable electrical engineering experience and at least three years' apprenticeship, and (ii) employment in responsible position for minimum of three years with well-established engineering concern providing wide experience in electrical and mechanical engineering practice.

Application forms, quoting ref. D.530/54-A, from M.L.N.S., Technical & Scientific Register (K), Almack House, King Street, London, S.W.1. 204

LONDON ELECTRICITY BOARD

Engineering Draughtsmen

APPLICATIONS are invited for the above positions in the South Eastern Sub-Area based at Woolwich, London, S.E.18.

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: drawing office routine, electrical diagrams, obtaining and recording all mains work and plant layout in transformer chambers.

The posts are graded under Schedule D of the National Joint Board Agreement as Grade 6, £535 10s. to £661 10s. per annum, inclusive of London allowance.

Application forms obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed by 31st December, 1954. Please enclose addressed envelope and quote ref. V/1842/R on envelope and all correspondence. 6596

CENTRAL ELECTRICITY BOARD, MALAYA

MECHANICAL ENGINEER required by the above Board. Salary scale (including expatriation pay and present temporary allowance at rate for single men) equivalent to £1,197 rising to £2,100 a year. Commencing salary according to qualifications and experience. Additional temporary allowances totalling £210/£399 a year (married men) and £301/£630 (family men).

Option of appointment either (a) on agreement for three years with prospect of permanency, or (b) on contract for three years with gratuity of £200 or £280 for each year's service according to salary. Opportunity of terminating appointment after one year's service. Free passages. Liberal leave on full salary.

Candidates must have served an apprenticeship with a firm of diesel engine manufacturers and have had not less than five years' experience on erection and/or maintenance of engines and power plant. They should have a knowledge of A.C. electrical generators of types normally driven by diesel prime movers. Preference will be given to candidates possessing a 1st Class M.O.T. Diesel Certificate.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2A/30065/EF. 6638

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the posts of:—

SHIFT CHARGE ENGINEER, NORWICH GENERATING STATION. Salary Class F, Grade 7, £755 × £15 to £800 per annum.

Applicants should have served an apprenticeship and obtained a Higher National Certificate in Electrical and/or Mechanical Engineering or equivalent, and possess experience in the operation of generating stations.

JUNIOR ENGINEER, NORWICH GENERATING STATION. Salary Class F, Grade 14, £475 × £15 to £520 per annum.

The duties of the successful applicant will include assisting in the control room on shift and other operation and investigation duties. Preference will be given to applicants who have had previous experience in a generating station and who have reached the standard of the Ordinary National Certificate in Electrical Engineering or its equivalent.

Applications stating age, qualifications and experience should be sent to the Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, London, N.14, by 1st January, 1955.

W. N. C. CLINCH,
Controller. 6613

WEST SUSSEX COUNTY COUNCIL

County Architect's Department

APPLICATIONS are invited for the appointment of a TEMPORARY ASSISTANT ELECTRICAL ENGINEER-DESIGNER-DRAUGHTSMAN at a salary between £600 and £725 per annum, according to experience, for a minimum period of two years, subject to satisfactory service.

Further particulars should be obtained from the County Architect, County Hall, Chichester, to whom detailed applications must be submitted not later than the 5th January, 1955.

T. C. HAYWARD,
Clerk of the County Council.

County Hall,
Chichester.
1st December, 1954. 6504

SOUTH WALES ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER required in the Central Sub-Area of the Board at Cardiff.

Salary Class K, Grade 13 (£675 × £15 to £720) of N.J.B. Schedule.

Applications, stating age, present position and salary, qualifications, experience, and three referees, to be addressed to the Secretary, to arrive by 31st December, 1954.

D. G. DODDS,
St. Mellons, Secretary.
Cardiff. 6580

BRITISH ELECTRICITY AUTHORITY

South Wales Division
(Vacancy No. 120/54)

APPLICATIONS are invited for superannuable N.J.B. appointment of GENERAL ASSISTANT ENGINEERS, Technical Department, Divisional Headquarters. Salary AX/CX6, £600-£765 per annum. H.N.C. or equivalent qualifications desirable.

General Section. Commissioning, maintenance and fault investigation of protective gear and electrical plant in generating stations and 132 kV substations.

System Development Section. Assist in design of 132 kV transmission system and investigation of a wide range of system problems.

Measurement Section. Applicants should be familiar with the use of potentiometer equipment and standardization of indicating instruments; experience in calibration of electrical instruments and polyphase integrating meters.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 31st December, 1954. 6670

CHIEF ENGINEER

required by an internationally known manufacturer of

SWITCHGEAR

CANDIDATES must have had extensive experience in the design and development of medium and high-voltage switchgear. This is a senior post in the organisation and an adequate salary commensurate with ability and experience will be paid to the selected candidate. Housing assistance will be given if required. Please apply giving fullest details of previous experience to Box 6564.

LONDON ELECTRICITY BOARD

Principal Assistant

APPLICATIONS are invited for the above position in the Internal Audit Section of the Chief Accountant's Department.

Candidates should have had experience of the audit of large undertakings, and should have recognised accountancy qualifications. Experience in the Electricity Supply Industry is desirable but not essential.

The post is graded within the National Joint Council Agreement (Administrative and Clerical Grades) as Grade 9, i.e. £1,000 to £1,120 per annum, plus the appropriate London area allowance.

The successful candidate will be based at 46, New Broad St., E.C.2, but will be required to work anywhere within the London Board area.

Application forms obtainable from Personnel Officer, 46, New Broad St., E.C.2, to be returned completed by 29th December, 1954. Please enclose addressed envelope and quote ref. V/1863/R. on envelopes and all correspondence. 6643

ADMIRALTY—
ROYAL NAVAL SCIENTIFIC SERVICE

DRAUGHTSMEN required in Admiralty Research and Development Establishments in London (Teddington area), Bournemouth and Weymouth with experience in any of the following classes of equipment: light to medium electrical, electro-mechanical, precision mechanical and electronic.

Candidates must be British subjects aged 21 years or over, with at least 3 years' practical workshop training besides drawing office experience, and have O.N.C. or equivalent.

Appointments unestablished but opportunities will occur to compete for established posts and for promotion.

Starting pay (London rate) £420 per annum (age 21), £580 (age 28) rising to £670; slightly less in the Provinces.

Apply stating age, training, experience and qualifications to Admiralty (C.E. II, Room 92), Empire Hotel, Bath. 201

ADMIRALTY: TECHNICAL CLASSES

THE CIVIL SERVICE COMMISSIONERS announce a supplementary Reconstruction Competition for men to fill three posts as DEVELOPMENT ASSISTANTS at the Admiralty Engineering Laboratory, West Drayton, Middlesex. The duties involve experimental and development work in connection with the electrical equipment of warships.

Candidates must possess H.N.C. in Electrical and/or Mechanical Engineering or an acceptable equivalent. They must normally have served an engineering apprenticeship or its equivalent, followed by four years' adult experience.

Salary scale £650 (at age 30) to £761. Starting salary according to age, e.g., £550 (at 25) up to £761 (at 36 or over). Promotion prospects.

Further particulars and application forms from Civil Service Commission, Scientific Branch, 30, Old Burlington Street, London, W.1, quoting No. S262/55. Completed application forms must be returned by 12th January, 1955. 6561

ELECTRICAL ENGINEERS AND PHYSICISTS

THE GENERAL ELECTRIC COMPANY LIMITED, Witton, Birmingham, 6, has vacancies for ELECTRICAL ENGINEERS and PHYSICISTS, age 23 to 30, possessing a degree or Higher National Certificate, and with some practical engineering experience, for design, development and experimental work on rotating machines, switchgear, transformers and rectifiers.

Prospects for advancement are excellent.

Applications, which will be treated as confidential, should be addressed to the Staff Manager, stating age, qualifications and experience.

6373

BRITISH ELECTRICITY AUTHORITY

South Western Division

GENERAL ASSISTANT ENGINEERS required in the Technical Department, Bristol and Plymouth. Superannuation scheme. Salary N.J.B. Class AX/CX, Grade 6, £600-£765.

Applicants should possess qualifications leading to A.M.I.E.E., and have served with one of the leading electrical manufacturers. They should have an interest in protective gear design and generator and switchgear testing.

Applications on form A.E.6/ACT, obtainable from Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 1st January, 1955.

Previous applicants need not re-apply. 6614

MIDLANDS ELECTRICITY BOARD

THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER required in the Kidderminster District of the Worcester and District Sub-Area. Duties will include advising consumers in respect of electrical equipment, estimating and contracting work, etc. Experience of D.C./A.C. changeover would be an advantage. Technical qualifications desirable.

Salary £635/£680 per annum (N.J.B. Class F, Grade 10), superannuable.

Apply in writing within 14 days, stating age, experience, present salary and position, to Mr. R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

A. STEPHENS,
Secretary.
6669

GRADUATE CHEMIST

required for work on power cables. Experience in the field of plastics would be a distinct advantage. Salary fully commensurate with qualifications and experience.

Applications giving full particulars of qualifications and experience to Employment Manager, Messrs. Johnson & Phillips Limited, Victoria Works, Charlton, London, S.E.7. 6581

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for a post as SENIOR ASSISTANT, EDUCATION AND TRAINING SECTION, DIVISIONAL SECRETARY'S DEPARTMENT. (S/13.597).

Duties will include assisting the education and training officer with training schemes for engineering and non-engineering staff and practical experience of this work is desirable. A knowledge of the requirements for membership of appropriate professional institutions and the ability to advise employees on part-time study courses will be an advantage.

Applicants should preferably possess a University Degree or appropriate professional qualification.

Salary N.J.C. Grade 4, £605-£665.

Special application forms, obtainable from P. D. A. Oliver, Divisional Secretary, 111, High Street, Portsmouth, should be returned by 30th December, 1954. Please quote reference M.G. 6671

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the appointment of THIRD ASSISTANT ENGINEER, Chief Engineer's Department, Operation and Maintenance Section, Communications Sub-Section, with location in Middlesbrough area.

Applicants should have qualifications entitling to Graduate Membership of I.E.E. and have a sound training and practical experience of magneto and automatic telephone systems, telephone repeaters, supervisory equipment and V.H.F. radio installations.

Salary Schedule C, Grade 4, £750/£950. N.J.B. conditions of service.

Applications, stating age, qualifications, experience and positions held, should be forwarded to the Secretary, Carliol House, Newcastle upon Tyne, 1, within ten days of the appearance of this advertisement. 6636

CITY OF BATH TECHNICAL COLLEGE

Principal: A. H. Yates, B.Sc., B.Sc.(Eng.), A.F.R.Ae.S.

Department of Engineering and Science

REQUIRED, as soon as possible, ASSISTANT LECTURER (Grade A) for City & Guilds Classes in Electrical and Mechanical Engineering for Day Release apprentices.

Applicants should hold a National Certificate and have had teaching or industrial experience.

Salary in accordance wtih the Burnham Technical Scale, at present £450 to £725. There are additional allowances for degree and training of up to £144.

Further particulars and application form from the Principal, Lower Borough Walls, Bath. 6631

ELECTRICAL ENGINEER

NELSON RESEARCH LABORATORIES, ENGLISH ELECTRIC CO. LTD., Stafford, have a vacancy for a young ELECTRICAL ENGINEER for interesting work in the development of new types of Electrical Machines. A degree in Electrical Engineering or Higher National Certificate with endorsements is essential.

Preference will be given to men between 22 and 26 years of age who have had a recognised apprenticeship and are free of military service commitments. A good starting salary with good prospects will be offered to the right man. Apply to Dept. C.P.S., 336/7, Strand, London, W.C.2, quoting ref. 305K. 6583

METROPOLITAN-VICKERS ELEC. CO. LTD.

require DESIGN DRAUGHTSMEN for METALCLAD AND HIGH-VOLTAGE SWITCHGEAR DEVELOPMENT. Senior and Junior positions available according to experience.

Applications giving details of experience, age, etc., should be addressed to the Personnel Manager, Metropolitan-Vickers Elec. Co. Ltd., Trafford Park, Manchester, 17. 216

CITY OF OXFORD EDUCATION COMMITTEE

College of Technology, Art and Commerce

Engineering Department

APPLICATIONS are invited for the post of SENIOR LECTURER in ELECTRICAL ENGINEERING. Candidates should have had industrial and teaching experience, and should hold a good honours degree in electrical engineering. Salary in accordance with the Burnham (Technical) Scale for Senior Lecturers, i.e., £1,065 × £25 to £1,215.

Application form and further particulars of the post may be obtained, on receipt of a stamped addressed foolscap envelope, from the Chief Education Officer, 77/79, George Street, Oxford, to whom completed forms should be returned within 14 days of the date of the appearance of this advertisement. 6592

THE GENERAL ELECTRIC CO. LTD.

Witton, Birmingham, 6

VACANCIES for DRAUGHTSMEN. The company offers varied and interesting careers to senior and junior draughtsmen experienced in any of the following:—

SWITCHGEAR: Airbreak circuit breakers; H.T. circuit breakers and metalclad switchgear; switch and control board layout; industrial control contactor cubicles; diagrams.

ROTATING MACHINES: Large A.C. and D.C. machines, including turbo and waterwheel alternators.

Five-day week. Superannuation scheme. Excellent conditions. Apply giving full details to the Staff Manager. 6487

CHIEF BUYER

APPLICATIONS are invited by an East Midlands electrical engineering company for the post of CHIEF BUYER.

Applicants must be capable of following budgetary arrangements and stock control systems, and preferably have held a similar post in the electrical engineering industry.

Contributory pension scheme.

Please write stating age, experience and present salary to—Box 2J.M.3362, A.K. Advg., 212a, Shaftesbury Ave., London, W.C.2. 6474

QUALIFIED ENGINEER

ABLE young QUALIFIED ENGINEER required by CIBA LABORATORIES LIMITED for their rapidly expanding modern pharmaceutical factory in Sussex. Opening provides scope for substantial development. Age under 35. Excellent conditions of employment, including pension fund. Initial help with housing for married man. Send details of education, qualifications, industrial experience and salaries earned to

Works Manager
CIBA LABORATORIES LIMITED
Horsham, Sussex

6525

SOUTH WALES ELECTRICITY BOARD

ASSISTANT, Commercial Department, required, District 462 (Newport), Eastern Sub-Area.

Successful applicant will be responsible to the District Commercial Manager for all domestic apparatus sales activities in the whole of the district.

Salary Grade 4 (£605/£665) of N.J.C. Schedule.

Applications stating age, present position and salary, qualifications, experience and three referees, to be addressed to the Secretary to arrive by 31st December, 1954.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. 6579

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following post:—

MAINTENANCE ENGINEER (Mechanical), Southampton Generating Station (S/13.598). Applicants should have experience in the maintenance of modern generating station plant and be capable of taking control of maintenance staff, and supervising turbine and boiler overhauls. Preference will be given to those possessing qualifications leading to Corporate Membership of a recognised professional institution.

Salary N.J.B. F/7, £755 × £15 to £800.

Special application forms, obtainable from P. D. A. Oliver, Divisional Secretary, 111, High Street, Portsmouth, should be returned by 28th December, 1954. Please quote reference E.R. 6668

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Dundee Area

APPLICATIONS are invited for the post of ASSISTANT CHARGE ENGINEER at Carolina Port Generating Station, Dundee, at a salary in accordance with Class F, Grade 9 of the N.J.B. Schedule (£675 × £15 to £720). Superannuation scheme applicable.

Applications giving age, qualifications and experience should reach the undersigned not later than fourteen days from the appearance of this advertisement.

P. PHILIP, M.I.Mech.E., M.I.E.E.,
Area Manager.

7, Dudhope Crescent Road,
Dundee.
December, 1954. 6563

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT of METER REPAIRER (MECHANICAL), PRESTON. Rate of pay 45.0d. per hour. N.J.I.C. conditions.

Applications to the Manager, No. 4 Sub-Area, North Western Electricity Board, 40/41, Lune Street, Preston, by the 29th December, 1954. 6611

A DRAUGHTSMAN, preferably under 30 years of age, with experience of light electro-mechanisms, instruments, or both, is required for a small team engaged in the design and manufacture of special-purpose apparatus. A sound background of workshop experience is essential. The appointment is at the applicational research centre of a major oil company near Chester. Starting salary according to age and experience; attractive pension benefits. Write giving full details to — Box ZO.100, Deacon's Advertising, 36, Leadenhall Street, London, E.C.3. 6492

A WELL-known company manufacturing electrical rotating machinery 1-100 h.p. has a vacancy for a senior sales engineer based on their London office. The successful applicant must be trained electrical engineer with Ordinary National Certificate as a minimum qualification and with previous experience in the London or South-Eastern Counties area. The post carries a responsibility for the organisation and control of three sales engineers. A generous salary is offered, together with non-contributory pension scheme.—Box 6489.

APPLICATIONS are invited by the Vacuum Oil Company Limited for the position of utilities generation shift engineer in their power station at Coryton Refinery. The station consists of three oil and gas fired I.C.L. boilers operating at 650 p.s.i.g., 750° F. m.c.r., each 180,000 pounds per hour, and three 5,000-kW Metro-Vickers double extraction condensing turbo alternators extracting at 125 and 20 p.s.i.g., generating at 11.0 kV, 3-phase, 50 cycles. Allied to this there is water softening equipment consisting of hot lime pre-treatment, hot zeolite finishing of 500,000 pounds per hour capacity, with miscellaneous auxiliary equipment. Conditions of employment include a pension and life assurance scheme, sickness benefit plan and other benefits. The successful applicant will be eligible for consideration in obtaining the tenancy of certain houses available to the company. Applications, giving full details of qualifications and experience, and quoting reference C.I., should be addressed to—The Industrial Relations Superintendent, Vacuum Oil Company Ltd., Coryton Refinery, Coryton, Essex. 6598

A VACANCY exists for an engineer in a laboratory undertaking investigations into light electrical and mechanical devices. Applicants should be capable of making critical surveys of such devices and making recommendations for their improvement. Age limits 25-35 years. Minimum qualifications H.N.C. (Electrical) with endorsements. Salary according to age and experience. Write giving details of experience to—Box 6617.

A WELL-known electrical company has a vacancy for a senior fusegear sales engineer. Applicants must be trained engineers with Ordinary National Certificate as minimum qualification and have extensive commercial experience in this field. A generous salary is offered, together with non-contributory pension scheme.—Box 6490.

AN experienced D.C. designer capable of using his initiative required for interesting work on dynamo electric machines from 5 to 5,000 h.p./kW. A superannuation scheme in operation and the usual social amenities available in an organisation of progressive outlook. All applications will be treated with the strictest confidence and should be addressed to—The General Manager, Lancashire Dynamo & Crypto Ltd., Trafford Park, Manchester, 17. 6219

ASSEMBLERS, experienced manufacture and repair small fractional h.p. motors. London district.—Box 6414.

ASSISTANT electrical engineer, aged 24 to 30 years, required for maintenance and installation work. Applicants must have a university degree in electrical engineering and have served an apprenticeship with one of the leading electrical manufacturing companies. A knowledge of electronics and instrumentation would be an advantage but is not essential. Applications should be addressed to — The Personnel Officer (Staff), Pilkington Brothers Limited, St. Helens, Lancashire. 6618

BOOTS PURE DRUG Co. Ltd., require an electrical engineering draughtsman, age 25-30. Salary £500-£600 per year, according to qualifications and experience. Five-day week, superannuation scheme. Applications in writing, to—Personnel Manager, Station Street, Nottingham. 6533

BRUSH ELECTRICAL ENGINEERING Co. Ltd., Loughborough, Leics, has vacancies for research engineers to assist with advanced projects connected with the development of new processes and materials for rotating electrical machines. Men interested in servo-mechanisms, computers, ventilation, insulation, mechanical design and associated technologies are invited to apply. Candidates should possess a good degree in electrical or mechanical engineering and have previous experience of research or development, preferably on electrical machines. Conditions of service include non-contributory staff assurance schemes. Please reply with full details to—The Chief Personnel Officer, Brush Electrical Engineering Co. Ltd., Loughborough, Leics. 6577

BRUSH ELECTRICAL ENGINEERING Co. Ltd., Loughborough, Leics, has a vacancy for a research engineer to assist with projects connected with high-voltage technology and the development of power transformers. A good degree in electrical engineering or physics is necessary, with experience of transformer design, manufacture, associated techniques. Consideration will be given to candidates with suitable educational qualifications and experience of research in kindred fields who wish to develop further knowledge and experience in this important work. Existing facilities provide opportunities for original research. Please write with full details to—The Chief Personnel Officer. 6619

CHEMIST required by a firm of electric cable manufacturers in the North-West area. Experience in rubber cable manufacture preferred but not essential. Superannuation fund and 5-day working week. Reply stating age, experience and salary required to—Box 5994.

CLERK, age 20-24, required by electrical contractors, Westminster, for pricing department. Electrical trade an advantage. Write stating age, experience and salary reqd.—Box 6600.

CROMPTON PARKINSON Ltd., Chelmsford, Essex, have vacancies for draughtsmen in drawing office engaged in design and development of industrial indicating instruments. Applicants should state age, experience and salary required to the Personnel Officer. 6340

CONDUIT fittings. Agents required for (a) London area, (b) Lancashire and Yorkshire, to sell to the wholesale trade. Good opportunity for young man willing to work. Remuneration by commission only.—Box 7774.

CONTRACTORS require fully experienced L.T. and E.H.T. cable jointers for work in Midland area. Able to drive an advantage. Please apply in the first instance to—Box 6601.

CONTRACTS engineer required by company in South Wales manufacturing electrical rotating machinery 1-100 h.p. Applicants for preference should have served a recognised apprenticeship and possess O.N.C. as minimum qualification. At least three years' experience in a commercial department is required. A generous salary is offered, together with non-contributory pension scheme.—Box 6491.

CROMPTON PARKINSON Ltd. require both senior and junior draughtsmen at their Chelmsford works. Applicants should have either contract, development or diagram experience on switchgear up to 11 kV, although men with general electrical or mechanical experience will be considered. Ideal terms of employment. Apply giving full particulars to the Personnel Officer. 226

DESIGN engineer required for the development of outdoor type high-voltage isolating switches and fuse gear for 11 kV and above. Applicants must have had good drawing office training and experience in the design of similar equipment. Write, giving full particulars of experience, age and salary required, to—Box 6621.

DESIGN engineer with electro-mechanical experience, and preferably knowledge of railway traction conditions, is offered interesting and rewarding opportunity to head up rapidly expanding section engaged in research and development of electro-mechanical speed indicating and recording equipment and tachometer applications generally. Applicants are sought with initiative, sound technical background, experience in this field, and the ability to initiate designs and to carry through to production stage. This is a senior position carrying a substantial salary. Applications, giving fullest particulars, to—Personnel Manager, Elliott Bros. (London) Limited, Century Works, Lewisham, London, S.E.13. 6360

DIESEL engineer experienced in running and maintenance of English Electric and Ruston generators and able to carry out complete overhauls. Permanent position. Apply in writing, to—Personnel Controller, Bentalls of Kingston-on-Thames, Surrey. 6674

DRAUGHTSMAN required by consulting engineers for the reproduction of electric light and power schemes. Previous experience essential. Write, stating age, experience and salary required, to—E. Wingfield-Bowles and Partners, 32, Old Queen Street, Westminster, London, S.W.1. 157

DRAUGHTSMAN required by prominent firm in West London for preparation of lighting and power schemes for all types of buildings. Pension scheme, social and sports facilities. Apply stating age, experience and salary required to—Box 6443.

DRAUGHTSMEN required for automatic electric control gear; 5-day week; excellent working conditions; canteen facilities; convenient transport; incentive bonus; superannuation scheme; salary according to qualifications, ability and experience. Apply — Asst. Sec., Watford Electric & Mfg. Co. Ltd., Watford, Herts. 6234

DRAUGHTSMEN required for mechanical design of compressed air components. Some mechanical experience essential. Applications giving details of experience, age, etc., should be addressed to—Personnel Manager, Metropolitan-Vickers Elec. Co. Ltd., Trafford Park, Manchester, 17. 217

ELECTRICAL draughtsmen required by instrumentation division for careers in automatic control engineering. Age 25/30, minimum O.N.C., and preferably experience in electrical control schemes. 5-day week, non-contributory pension scheme. Attractive salary and excellent opportunities for progress. Apply Personnel Manager, Costain-John Brown Ltd., 40, South Street, London, W.1. 6633

ELECTRICAL designer required. Must have practical experience in the design of A.C. and D.C. motors, 1-200 b.h.p. Reply in confidence, stating age, experience, and salary expected.—Hugh J. Scott & Co. (Belfast) Ltd., Volt Works, Ravenhill Road, Belfast. 6645

ELECTRIC lamp development engineer. Crompton Parkinson Limited have a vacancy in their lamp development and research laboratories at Guiseley for experienced lamp or radio valve technician, capable of carrying out specific investigations and development work on electric discharge lamps, etc. The position vacant offers good salary rates and good prospects of promotion. Preference given to graduate physicist or electrical engineer. Superannuation scheme. Write in confidence, with full details, to — Reference LLD, Crompton Parkinson Ltd., Guiseley, Nr. Leeds. 6603

ELECTRICAL contractors (S.W. London) require estimating and supervising engineer, experienced in good-class installations. Apply stating age, experience and salary reqd. —Box 6599.

ELECTRICAL design draughtsman required with H.N.C. or equivalent qualification and practical works experience. Work entails preparation of circuit diagrams, etc., for automatic control of rubber machinery. Knowledge of industrial electronics an advantage.—Personnel Manager, Dunlop Rubber Co. Ltd., Fort Dunlop, Birmingham, 24. 6605

ELECTRICAL draughtsman required for the electrical division of the engineering department of medium/heavy engineering industry. Should have experience in preparation of drawings for electrical installation work and circuit diagrams. Applications to—Personnel Manager, Ruston-Bucyrus Ltd., Excavator Works, Lincoln. 6604

ELECTRICAL engineer required by electrical contracting company for service in British West Africa. Must have experience on preparation of specifications and estimates and supervision of contract work. Remuneration, including allowances, will depend on age and experience, but will start at not less than £1,000 p.a. Free furnished quarters, free passages and medical attention. Pension fund. Apply giving experience, qualifications and age to—Box 6622.

ELECTRICAL engineer required by large West End department store. The post is assistant to the chief engineer and applicants must have technical qualifications such as Higher National Certificate or equivalent and have a sound experience in all branches of electrical engineering. Must be able to control staff and estimate for new work and modifications to existing instalments. The position is permanent and pensionable and offers good prospects of advancement.—Box 6646.

ELECTRICAL engineers. McLellan and Partners, consulting engineers, have a few vacancies for young engineers interested in industrial work. Applicants must have a degree or equivalent and be trained by one of the larger electrical manufacturers. Reply to—32, Victoria Street, London, S.W.1. 6478

ELECTRICAL engineers of degree or H.N.C. standard and possessing industrial experience on experimental and development work are required for our research and development laboratories. They will be required to work on one or more of the following projects: special ignition apparatus, control systems, small motors and generators, etc. The work is extremely interesting and the prospects are excellent for men with the necessary initiative and technical knowledge. Please reply stating age, qualifications and experience to — Personnel Manager, Joseph Lucas (Electrical) Ltd., Great King Street, Birmingham, quoting reference PM/D/40. 144

ELECTRICAL fitter required by London service branch of Midland firm, located at King's Cross, must be conversant with small motors and willing to undertake some fitting and assembly work other than electrical. Ability to drive an advantage. Good permanent position. Hours, 8.30 to 5.30; 12.30 Saturdays. Please reply—Box 6648.

ELECTRO-mechanical engineer with commercial bias and preferably experience in railway traction conditions is offered first-class opportunity to develop and expand sales of electrical speed indicating and recording equipment of all types. Ability to co-operate fully with design and production staff, a real sense of purpose and drive will be rewarded with first-class salary and every opportunity of further progress within a rapidly expanding organisation with world-wide ramifications and connections. Applications giving fullest details to—Box E.R.596, c/o 191, Gresham House, London E.C.2. 6357

ELECTRICAL wholesalers, E.W.F. (London) require in the early New Year two experienced representatives. One for London, East London, Essex area, and one for North, North-West London and area. Must have established connection with contractors and users; existing substantial turnover will be given to suitable applicants. Brief particulars in first instance to—Box 6566.

ELECTRONIC engineers required. Excellent opportunity for men of degree standard to broaden experience in a field of great interest and variety and involving latest techniques. Restrictive specialisation can be avoided by joining Marconi Instruments, who produce light current communication, measuring and test apparatus for a wide range of requirements. Apply—Marconi Instruments Ltd., Longacres, Hatfield Road, St. Albans. 228

ELLIOTT BROS. (LONDON) Ltd. invite applications for appointment as sales and contract engineer in their electrical measuring instrument division. Electrical engineering background to H.N.C. level and experience of quotation work in industry desirable. Applications in confidence to—The Personnel Manager, Century Wks, Lewisham, London S.E.18. 6597

ENGINEER, aged 25/35, with electrical or physicist degree required by cable company in London area for development work on testing equipment for telecommunication cables. Permanent and pensionable position at salary commensurate with experience and qualifications. Apply giving full particulars to—Box 6501.

ENGINEER required for electro-medical service department. Applicants should have knowledge of electronic circuits and be prepared to travel in Greater London area. Apply for appointment by letter or telephone. —General Radiological Ltd., Electro-Medical Department, 18, New Cavendish St., London, W.1 (Phone, Welbeck 1212). 6479

ENGINEER required for experimental and development work on universal motors and domestic appliances. The work also involves some knowledge of airflow measurements and electronics, but versatility and ability to develop new ideas are of first importance. Applicants should have Higher National Certificate (Elect.) or equivalent, and preferably served an apprenticeship. Age 24 to 32. Write giving details of age, education and experience to—The Employment Officer, Hoover Limited, Perivale, Greenford, Middlesex. 6567

ENGINEERING draughtsman, senior, capable electrical layouts required by London firm engineers. Excellent opportunity progressive situation. Write age, references.—Box 6535.

ENGINEERING laboratory assistant required for the development of a wide range of electrical test equipment. Salary minimum £11 5s. per week at age 25. Applicants should have H.N.C. (Elct.) and preferably served an engineering apprenticeship and have knowledge of electronics. Write giving details of age and experience to—The Employment Officer, Hoover Ltd., Perivale, Middx. 6568

ENGLISH ELECTRIC VALVE Co. Ltd., Chelmsford, have vacancies for young engineers to work on radio valve design and development. Applicants should be of degree standard. Whilst experience of this type of work is desirable, it is not essential, and otherwise suitable candidates will be considered. Write giving full details, quoting ref. 497L, to Dept. C.P.S., 336/7 Strand, London W.C.2. 6565

ESTABLISHED firm seeks services of ambitious young man, fully experienced fractional h.p. motor winding, repair and manufacture, to start up and develop branch S.E. London. Salary and share of profits basis.—Box 6536.

F.H.P. motor development. English Electric, Bradford, wish to appoint an engineer to take charge of the mechanical development of electric motors and associated equipment for economic production. This is a new and interesting appointment for a fully qualified and experienced engineer. Please apply giving full details of experience and qualifications, etc., to Ref. 1161B, Dept. C.P.S., 336/7, Strand, London, W.C.2. 6529

FLAMESETTERS, preferably with previous experience of high-speed lamp-making machines (sealing, pumping and footmaking) required as group chargehands. Full details, stating age, experience and salary required.—Box 6584.

FOREMAN winder to take control of repair shop. Accommodation provided if necessary. Apply—Priory Electric Service (Coventry) Ltd., 3, Lower Ford Street, Coventry. 6559

FOREMAN (working) required for electric motor repair shop. Must be thoroughly conversant with all types of motors, A.C. and D.C. Good prospects and wages for right applicant.—Charles H. Harwood & Co. Ltd., 179, Kensal Road, London, W.10. 6623

FULL-time representative required by well-established manufacturers of high-grade switches, to cover the Northern Counties of England. Pleasant personality and contacts with leading electrical manufacturers and area boards. Knowledge of switching applications, particularly packet, rotary and toggle switches, an advantage. Reply giving full details, including experience, remuneration expected, and whether a car owner, to—Box 6606.

GRADUATE mechanical engineer required to work on steam power plant design. Applicant must have at least five years' experience on the design and layout of modern high-pressure, high-temperature central stations. The company is now actively engaged in extensive plant extensions of 25 and 45 MW size, the latter 900 lb. 900° F. On a long-term basis opportunity is offered for advancement in both technical and executive lines of public utility work. Salary paid will be according to ability, academic qualifications and experience. Apply giving age, training experience and approximate salary required. Address applications to—N. T. Smith, Manager, Nova Scotia Light and Power Co. Ltd., Halifax, N.S., Canada. 6497

GRADUATES in electrical engineering or physics required by well-known cable manufacturers, near London, for research and development work on all types of H.V. cables. Pension scheme and other amenities.—Box 6457

INDUSTRIAL mathematician. English Electric, Bradford, wish to appoint a mechanical engineer/mathematician for interesting work in the industrial motor development department. His main duties will be to take over and organise routine stress calculations as applied to all types of industrial motors and larger machines, and to analyse vibrations and similar problems. The applicant should be a competent mathematician and should preferably have an engineering degree and a certain amount of practical engineering experience. This is an interesting appointment with a good salary for right engineer. Please apply in strict confidence to Ref. 1369, Dept. C.P.S., 336/7, Strand, London, W.C.2, stating full personal qualifications and experience. 6624

JUNIOR draughtsman required for London office manufacturing and consultant electrical engineers. Write giving full particulars including salary required, to—Power Connectors Ltd., 2, Caxton Street, London, S.W.1. 7779

LARGE D.C. machine design. English Electric, Bradford, has a vacancy for a senior engineer with experience in D.C. machine design of 1,000 kW range. These motors and generators have interesting and special application in a wide industrial field. This is a senior appointment carrying an attractive salary. Please apply in strict confidence to—Ref. 758H, Dept. C.P.S., 336/7, Strand, London, W.C.2. 6528

LIGHTING engineer, I.E.S. member, required for London office, age 25-35 years. —Box No. 8210, c/o Charles Barker & Sons Ltd., 31, Budge Row, London, E.C.4. 6647

LINESMEN required by contractors for work on H.T., L.T. and steel tower lines in the Midlands. Please apply in the first instance to—Box 6602.

MAINTENANCE electricians required for steelworks plant in Cardiff. Knowledge of automatic control gear for A.C. and D.C. motors essential. Must be a member of E.T.U. Daywork on 44-hour week, but prepared to work shifts on 48-hour week.—Box 6333.

MARCONI INSTRUMENTS Ltd. have an immediate vacancy at St. Albans in their technical literature (telecommunications) section. The applicants should have electrical engineering qualifications and/or experience in the design or development of electronic equipment. The duties are varied and interesting and the post provides a permanent and pensionable position in a well-established company. Apply — Messrs. Marconi Instruments Ltd., Longacres, Hatfield Road, St. Albans. 227

MAINTENANCE electrician for goods and passenger lifts, also small motors, London area; able to drive service van. — Phone Macaulay 1066/7. 6585

MECHANICAL engineer required by cable works for production machine experimental and development work. Minimum qualifications H.N.C. Age limits 30 to 40 years. The prospects are good and this is an opportunity for a man who likes to see the results of his ideas put into practice. Commencing salary according to qualifications and experience. Pension scheme. Apply in confidence, giving particulars in chronological order, to—Works Manager, Southern United Telephone Cables Ltd., Dagenham Dock Essex. 6375

PHYSICIST or electrical engineer required as technical manager of a medium-sized company engaged in the manufacture of rubber and thermoplastic cables, to be responsible for the technical control of production and development of the company's products. Applicants should be graduates in physics or electrical engineering or hold equivalent qualifications, and must have wide experience of the electrical cable industry. Applications in writing, stating age, qualifications and experience and salary required, to be addressed to—Personnel Officer, St. Helens Cable & Rubber Co. Ltd., Trading Estate, Slough, Bucks. 6540

REPRESENTATIVE required by progressive mfg. co. of elec. engineers, E. London, to handle domestic lines. Connections with wholesalers an advantage but not essential. Remuneration will consist of basic salary plus commission based on results obtained. Applicants should be prepared to travel U.K. Write, giving full details of age, experience and present earnings, to—Box 6649.

REPRESENTATIVE required for London and South Coast area, based at our London office, with good contacts amongst manufacturing electrical engineers, electricity boards, wholesalers and engineering establishments. Preference will be given to applicants having experience of Ministry and Government departments requirements. Progressive post (superannuated) available for keen and energetic man, not older than 45, car an advantage. Salary, bonus and expenses paid. Apply in writing only, giving full particulars of experience, age and salary required, to the Secretary, William McGeoch & Co. Ltd., Manufacturing Electrical Engineers, 46, Coventry Road, Birmingham, 10. 6625

REPRESENTATIVE required for the South-West area by old-established manufacturers of open type switch and fuse gear, plugs and sockets, lighting fittings and accessories. A good connection essential with electricity boards, electrical wholesalers, engineering establishments and industrial undertakings. Car essential. Applicant with two other non-competitive agencies would also be considered. Apply in writing only, giving full particulars of experience, age and salary required, to—Secretary, William McGeoch & Co. Ltd., Manufacturing Electrical Engineers, 46 Coventry Road, Birmingham, 10. 6626

REPRESENTATIVES with established connections amongst electrical retailers required. Commission basis.—Box 6650.

QUALIFIED design and development engineer required by small but expanding company manufacturing control switchgear, specialising in limit, micro and rotary switches, in Birmingham area. Excellent prospects for advancement. Write fully stating past experience, qualifications and age to—Box 6459.

SALES engineer required for London and Southern Counties by progressive company manufacturing switchgear and distribution equipment. Applicants should preferably have had experience in the manufacture, installation and operation of distribution equipment for MV and HV systems. Write, giving full particulars of experience, age and salary required, to—Box 6620.

SENIOR estimator required with initiative and having experience in handling comprehensive enquiries involving rotating electrical machinery up to 5,000 h.p./kW. A superannuation scheme in operation and the usual social amenities available in an organisation of progressive outlook. Promotions inside and transfers to sales normally made from staff. All applications will be treated with the strictest confidence and should be addressed to—The General Manager, Lancashire Dynamo & Crypto Ltd., Trafford Park, Manchester, 17. 6218

SENIOR or junior draughtsman required for work on electrical power resisters and large electrical heaters for industrial applications. Previous experience on this class of work is desirable but not essential. Apply giving full details, including age, technical qualifications, whether married or single, and salary required, to—The Expanded Metal Co. Ltd., Electrical Dept., Stranton Works, West Hartlepool. 6586

SENIOR plant efficiency engineer (boilers and auxiliaries) required in Manchester by consulting engineers. Candidates should have an engineering degree and be thoroughly conversant with the conduct and full supervision of efficiency trials on large power station boiler plants and their auxiliaries. A knowledge of fuel and chemical engineering would be an advantage. The position is superannuated. Please apply to—Staff Applications, Kennedy & Donkin, 813a, Wilmslow Road, Didsbury, Manchester, 20. 6627

STREET lighting section of manufacturing electrical engineers in City (London) requires assistant (25/30 years) to handle quotations in sales office. Applicants must have good knowledge of street lighting equipment. Superannuation scheme. 5-day week. Apply stating age, experience and salary required to—Box 6451.

SWITCHGEAR draughtsmen required, with knowledge of H.V. outdoor switchgear and/or 11-kV oil-immersed metal-clad gear. Interview expenses paid. Help given to obtain accommodation if necessary. Apply in writing, giving details of qualifications, experience and salary, to — Switchgear and Equipment Ltd., Banbury, Oxon. 6481

TECHNICAL sales engineer, 28 years or over, to reside in the North West, preferably Manchester, with sound knowledge of electrical and electronic instruments, mostly in audio frequency range. Able to do routine servicing. Covering the North Western and North Midland areas of England and possibly short periods abroad. Degree or H.N.C. standard. All expenses and car provided. Apply in writing, stating age, experience and salary, to—Box 6651.

TELEPHONE engineer required by British-owned telephone administration operating in Portugal. Applications are invited from candidates who have specialised in development and planning of external plant and preference will be given to candidates with experience in lines and cable construction. They should have good organising ability and experience in controlling staff. Applicants should hold the qualifications required for Corporate Membership of the I.E.E. or the equivalent. Single preferably but not essential. Age approximately 30 to 35. Commencing salary, after local taxation, equivalent to approximately £1,150 per annum increased by 20% at the end of the second year with good steady prospects thereafter. Write particulars of qualifications and experience to—Box E.R. 653, c/o 191, Gresham House, London, E.C.2. 6644

TELEPHONE transmission engineer required by Compania National de Telefonos del Peru. Thorough knowledge and practical experience in fault finding and repair of single and 3-channel carrier equipment, overhead telephone line construction and exchange installation and maintenance. Preference given to single men who must be medically fit and prepared to work at high altitudes. Knowledge of Spanish an advantage but not essential. Salary 6,000 Soles per month (at present exchange about £115) plus benefits. Apply in writing giving full particulars to — Managing Director, Cable and Wireless Limited, Electra House, Victoria Embankment, London, W.C.2. 6587

THE TELEGRAPH CONSTRUCTION & MAINTENANCE Co. Ltd. invite applications for the post of commercial manager, cables division (Greenwich). A comprehensive experience in the cable industry is essential and must be supported by administration and organising ability. Full details to—Personnel Manager, Telcon Works, Greenwich, London, S.E.10. 6607

TRANSFORMER test engineer required having experience in routine testing of distribution, medium and large power transformers. Preference will be given to applicants holding H.N.C. Electrical Engineering. This is a permanent position with good prospects. Apply stating age, experience and salary required to — Denis Ferranti Company Ltd., Royton, Oldham, Lancs. 6482

TRADE counter assistant or charge hand required with knowledge of the electrical wholesale trade. Apply in first instance by letter to Superlamp Ltd., 24a, St. Giles High Street, London, W.C.2, giving full details of past experience and salary required. 6542

TRANSFORMER designer required by manufacturers in North-West London. All-round experience with electronic and power transformers up to 250 kVA essential. Housing assistance if required.—Box 6543.

TWO senior draughtsmen required immediately. This is an opportunity for men with progressive ideas to join in the development of an entirely new electro-mechanical product with an assured future. High salaries will be paid to the right men. Excellent working conditions, 5-day week, pension scheme, etc. Apply in writing—Brentford Electric Ltd., Kidbrooke Park Road, Kidbrooke, London, S.E.3. 6544

WELL-known electrical manufacturing company has a vacancy for a sales engineer for electrical rotating machinery in Sheffield. Successful applicant must be a trained electrical engineer with O.N.C. as a minimum qualification and with previous sales experience in the area covered. He will work from the company's existing branch office. Remuneration by salary and expenses. Non-contributory pension scheme.—Box 6446.

WINDERS, experienced small fractional size armatures and stators, home workers considered. London district.—Box 6415.

YOUNG radio engineer with practical experience, for experimental and development work on interference suppression equipment to Ministry requirements, to work without supervision in laboratory and on site.—Aish & Co. Ltd., Poole. 6569

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

ADVERTISER (37), 22 years' experience with leading electrical inst. manufacturer, 14 years as supervisor, desires responsible position.—Box 7767.

ELECTRICAL clerk of works now 65, active, any capacity considered. London district.—Box 7768.

ENGINEER (35), qualified and widely experienced in precision/instrument electro-mechanical/electronic design, development and liaison; seeks position in which ability, energy and loyalty can be well utilised.—Box 7778.

INDIAN graduate electrical engineer (26), going to be I.E.E. graduate, experienced in E.H.T. switchgear installation, seeks drawing office job.—Box 7775.

FOR SALE

TRANSFORMERS (SECONDHAND) FOR SALE

750 kVA	3-phase	22kV/11kV	O.D.
500 „	3 „	6.6/11kV	O.D.
200 „	3/6 „	6.6/480v.	I.D.
125 „	3 „	6.6/415v.	I.D.
75 „	3/6 „	6.6/415v.	I.D.
50 „	3 „	6.6/200v.	I.D.
100 „	3 „	3.3/440v.	O.D.
50 „	3 „	2.2/415v.	I.D.
20 „	3 „	2.2/400v.	I.D.
10 „	1 „	2.2/240v.	I.D.
50 „	1 „	6.6/110v.	I.D.

Further details and offers to Sub-Area Manager, Midlands Electricity Board, Kingsway, Stoke-on-Trent. 6653

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ENGLISH ELECTRIC 576-kW Steel Tank Mercury Arc Rectifier complete with high and low vacuum pumps, auxiliaries, etc.; in full working order. Fitted with on-load tap-changing equipment. Has operated on a 3-wire network (outers only) and used in conjunction with external balancers (no mid wire) D.C. volts 440/480 D.C. amps. 1,200. Transformer 3/6 phase, 6,600/464 volts at no load.—Box 6652.

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Item 3—One CROMPTON PARKINSON Base Mounted Motor, ¾ h.p., 1,425 r.p.m., 200-225 v. D.C. Used belt drive to refrigerator.

Item 4—Two CROMPTON PARKINSON Base Mounted Motors, ½ h.p., 1,425 r.p.m., 200 v. D.C.

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Item 7—Seven DELCO Motors, motor pivot fixing, ¼ h.p., 1,425 r.p.m., 200 v. D.C. Refrigerator.

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Offers, marked "Motors/Fans," should be sent to Group Secretary, Camberwell H.M.C., Dulwich Hospital, East Dulwich Grove, London S.E.22, by not later than 21 days after this publication. 6634

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UNUSED 18-b.h.p. NATIONAL vertical twin-cylinder Diesel Engines, type DA2, 1,000 r.p.m.; with radiator, circulating pump, pressure gauge, air filter, etc.

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TWO 500-kVA BRUCE PEEBLES, indoor type, 3-phase, ratio 11,000/430 volts, new 1950, unused.

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90-h.p. CROMPTON PARK. Slipring, tot. encl. frame, speed 740.
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TWO 400-volt, 220-kW, 3-wire, 600-r.p.m. D.C. GENERATORS, single bearing, suitable for direct coupling to an engine flywheel, complete with static balancer for 137 amperes out of balance. Manufactured G.E.C. Run approx. 1,500 hours.
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ONE CARL SCHENK, LAWACZECK HEYMAN system dynamic balancing machine suitable for balancing rotors, shafts, etc., of electric machines from 1 to 15 tons. Shaft bearing diameter 4" to 11¾". Distance between bearings 25" to 13'. Complete with 50-h.p. variable speed driving motor, 220 volts D.C., electro-magnetic coupling, etc.

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ABABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 50,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p. Spencer-Bonecourt boiler; also marine, Cornish vertical, etc. We install complete, including brickwork.—Burford, Taylor & Co. Ltd., Boiler Specialists, Commercial Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A HIGH-vacuum impregnation unit or single or batch coil impregnation service to RIC Specification 214 or individual requirements.—Blickvac, Hamilton Road Works, Hamilton Rd., London, S.E.27 (Tel. Gipsy Hill 4394). 44

A.C. and D.C. house service meters, all sizes, quarterly and prepayment, reconditioned, guaranteed one yr. Repairs and recalibrations. —The Victa Electrical Co., 47, Battersea High Street, S.W.11 (Tel. Battersea 0780). 138

A.C. and D.C. motors, all sizes, large stocks, fully guaranteed. — Milo Engineering Works, Milo Road, East Dulwich, S.E.22 (Forest Hill 2278-9). 102

ALTERNATORS for sale. All sizes, voltages and frequencies. Exciters, automatic voltage regulators and switchboards available. —Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 6658

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5506/9). 91

ALTERNATOR control panel cubicles, 1,000 kW, 500 kW, 250 kW, 150 kW, 3-phase, 400 volts.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 23

ALTERNATOR, E.C. Co., 18.75 kVA, 400/3/50, continuous at 1,000 r.p.m., with integral exciter and separate Isenthal auto volt regulator; almost unused. Offers to—Box 7780.

ALTERNATORS, 2 to 30 kW, 1 and 3-ph., and D.C. generators, 300 w. to 24 kW. Lists.—Powerco Ltd., Wandsworth Town Station, York Road, London, S.W.18 (Vandyke 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

BARGAINS in electric motors are always being obtained from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Stocks include A.C. and D.C. motors, second-hand and new up to 30 h.p. Starters, slide rails and pulleys. Ring Moon. 3355 for your requirements. 50

BROOKHIRST 30-h.p. slipring type PHA starter, 400 volts, 3-phase. Never used. —Box 7781.

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CIRCUIT breakers, 300 amps., 3-phase, 50 cycles, Crompton Parkinson clad type, floor mounting, 25 MVA rupturing capacity. Number available. — Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 21

CONDENSERS, 1 200-kVAr, 1 150-kVAr and 1 80-kVAr, with control switches, 415v./3/50. Further particulars write — Box 7776.

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks. — Britannia Manufacturing Co. Ltd., 22/26 Britannia Walk. London N.1. 22

DIESEL generating sets, English manufacture, direct current, all voltages, all sizes to 500 kW.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 17

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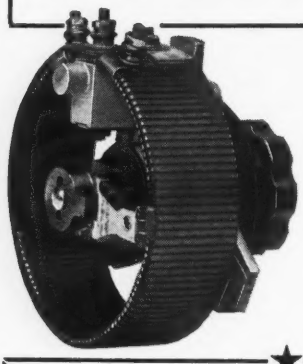

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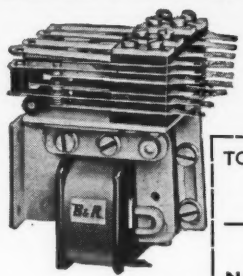

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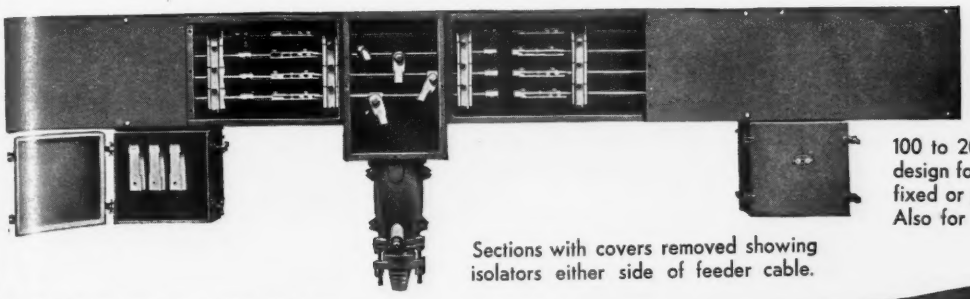

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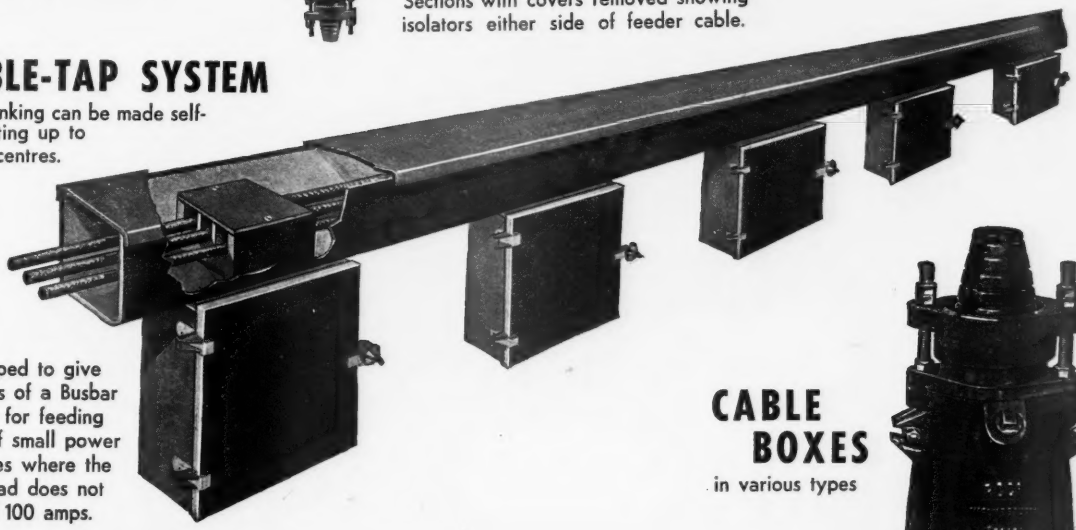

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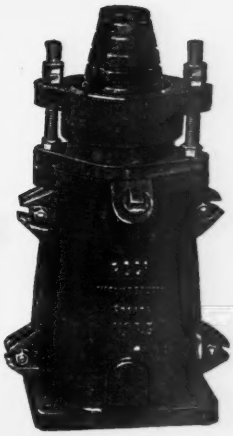

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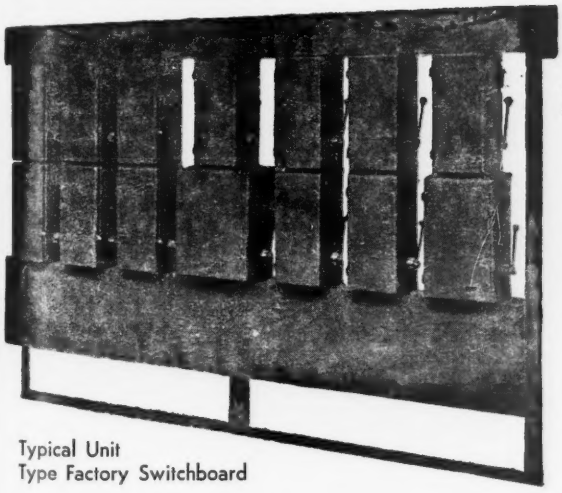

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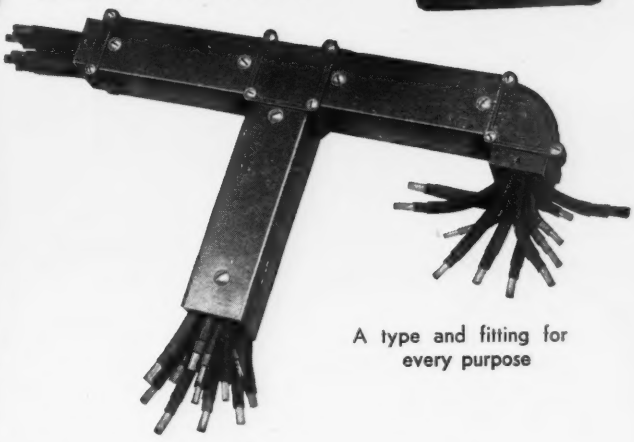

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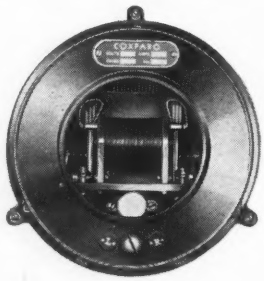

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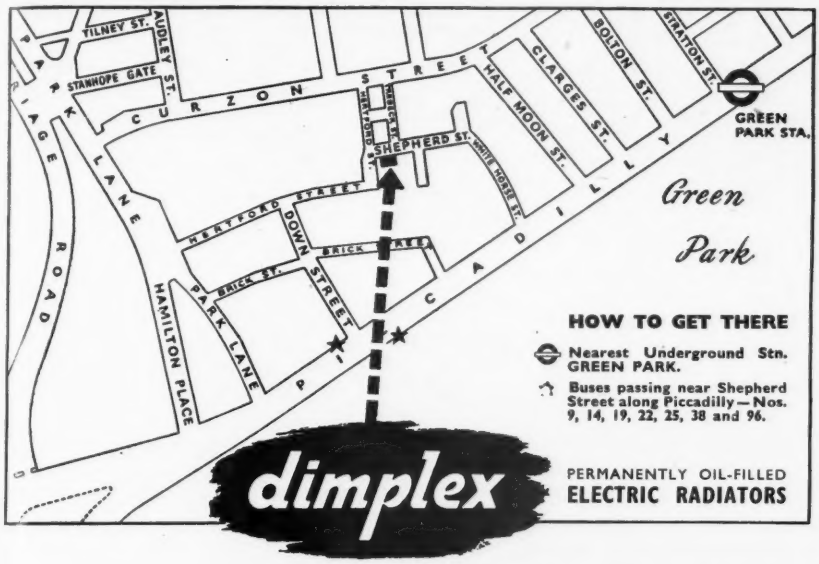

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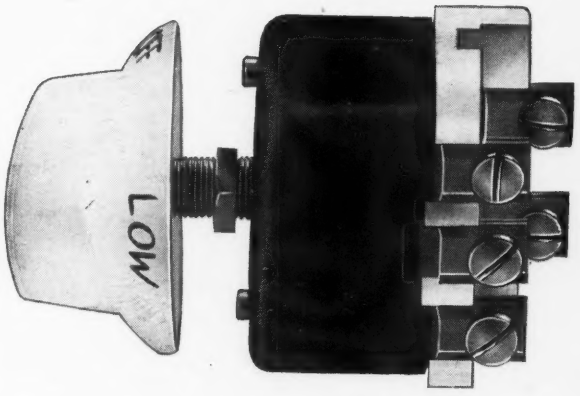

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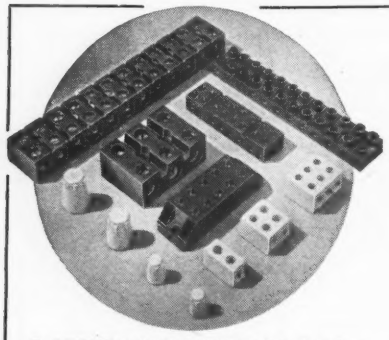

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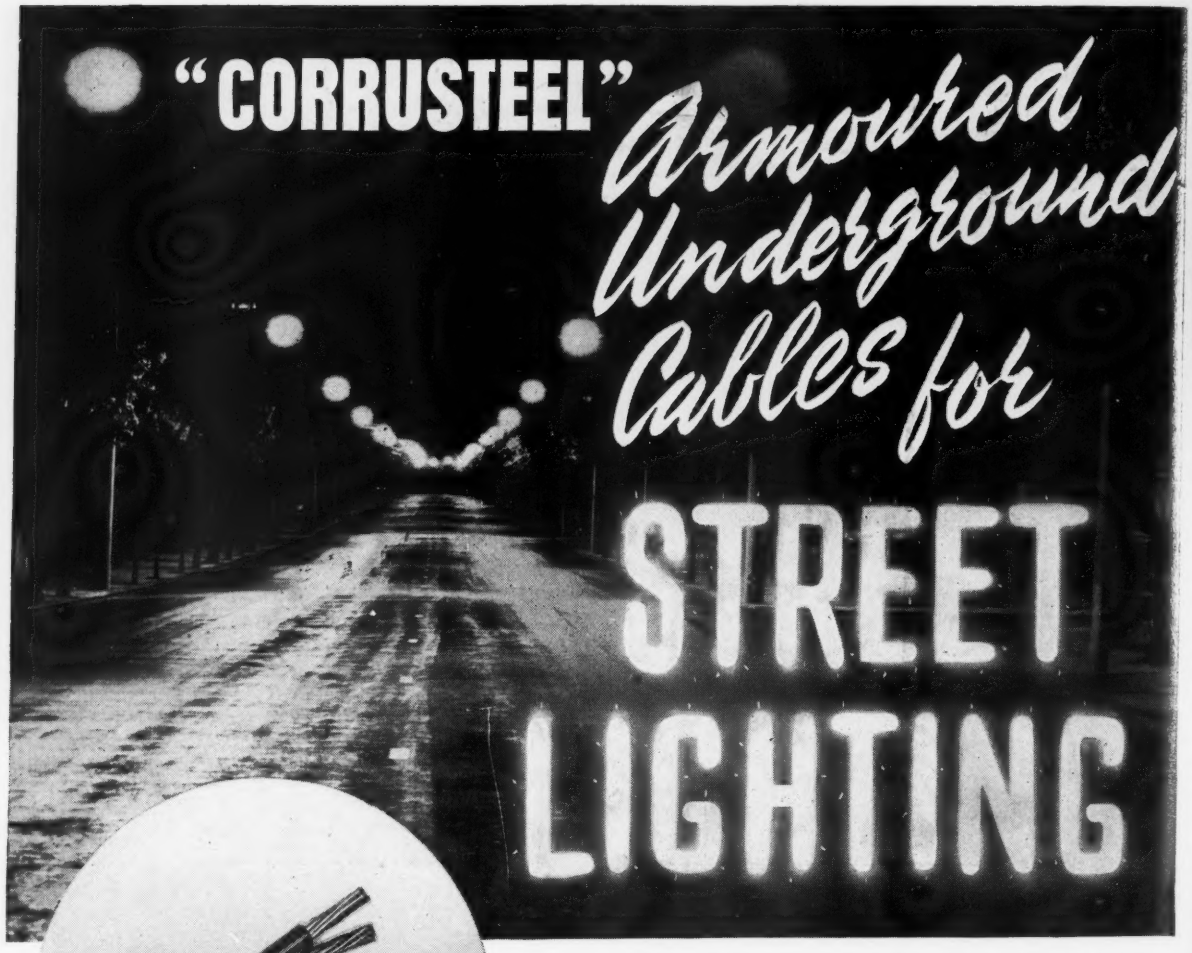

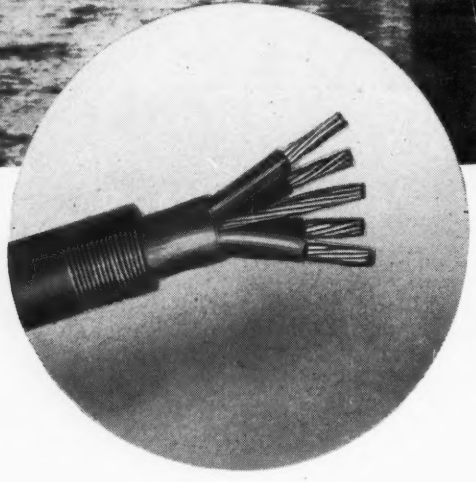

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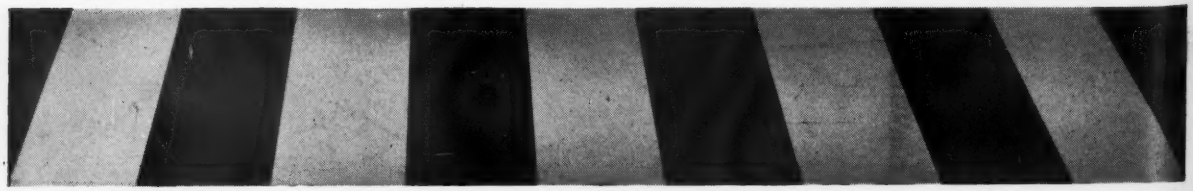
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